Rock Products
With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

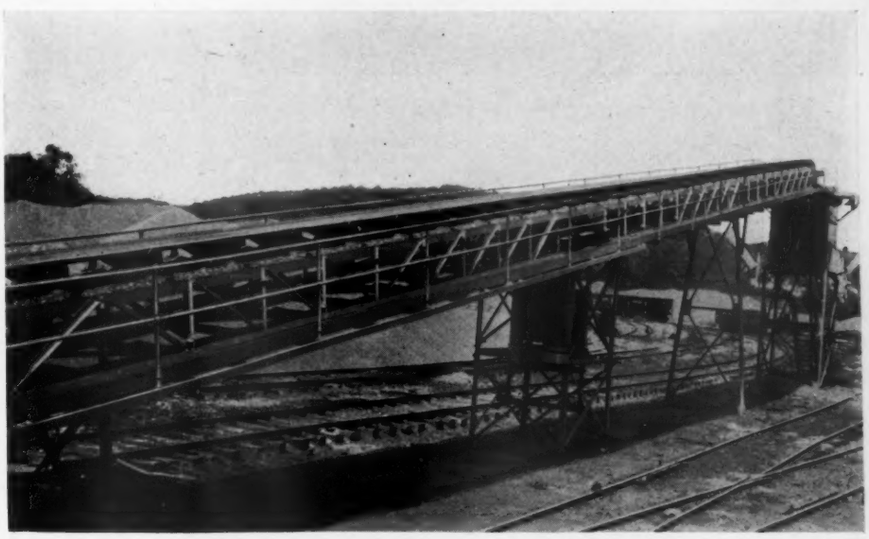
Volume XXXV | Chicago, November 19, 1932 | Number 23

Changes at Missouri Sand and Gravel Plant

Alpha Portland Cement Co. Improves Screening and Loading Arrangements at Its Plant Near St. Louis

DURING the year the Alpha Portland Cement Co. has made a number of changes and improvements at its Glencoe, Mo., gravel plant. These improvements were mostly for the purpose of enabling the plant to more easily meet the new specification for coarse aggregate in the St. Louis district. This plant, which is about 20 miles west of St. Louis, has been operated for a number of years by the Central Building Materials Co. of St. Louis, but was returned to the Alpha company as a result of the recent dissolution of the Central Building Materials Co.

The plant is located on the Meramec river and the material is obtained by dredging from the bed of the river, being then unloaded from the barges to a hopper at the plant by a clamshell bucket. From the hopper the material is drawn on to an inclined belt conveyor and carried to the top of the washing and screening plant. This part of the plant has not been changed, but entirely new washing and screening equipment has been installed. Formerly the material passed over a series of inclined stationary screens upon which streams of water were played. This equipment has now been replaced by a series of vibrating screens.



Belt conveyor leading out to car loading hopper

General view of plant, screens and bins at center and loading point at left

Main bins with loading conveyor taking off at right

Vibrating Screens Now Used

The belt conveyor delivers the raw material to a Robins double-deck "Gyrex" screen which is located on the top floor of the plant. Here the preliminary sizing is done, the oversize which passes over the top deck going to a crusher for recrushing. The material passing over the lower deck is delivered to another vibrating screen on the floor below, and the material passing through the lower deck of the top screen is delivered to a second screen on the floor below. The two screens on the lower floor are both double-deck "Gyrex" vibrating screens similar to the one above.

Washing is accomplished by means of strong sprays of water directed against the screening surfaces. The two screens on the lower floor are placed end to end for better utilization of the space in the plant and for better distribution of the sized material to the bins below. Each screen separates out three sizes and is individually driven by an Allis-Chalmers motor.

On the floor below the two sizing screens and above the bins two Allen sand cones have been installed for dewatering the sand. These are supported on the steel structure which carries the three vibrating screens. The entire plant is of steel and concrete construction.

Improved Car Loading Methods

An additional important change in the plant is in the car-loading arrangements. Formerly railroad cars were loaded direct from the bins on tracks in each of the two passageways below the bins. One of these passages remains unchanged and has a track through it for car loading of sand direct from the bins. The other, however, has been arranged with a belt conveyor which extends under the bins and out at one end to a loading hopper a couple of hundred feet away from the plant.

In this tunnel seven loading gates and chutes deliver the different sizes of material to the conveyor belt. The loading conveyor, which is slightly inclined, is driven by a 20-hp. Allis-Chalmers motor through a James speed reducer at the head end. This conveying and loading equipment was furnished by the Robins Conveying Belt Co.

One of the advantages of the new loading arrangement is that any desired mix of materials can be delivered to cars and be properly combined and mixed on the conveyor belt so that there is no segregation of sizes in the car. The conveyor delivers to a car-loading hopper which has a chute on each side, so that cars can be loaded on either of two tracks.

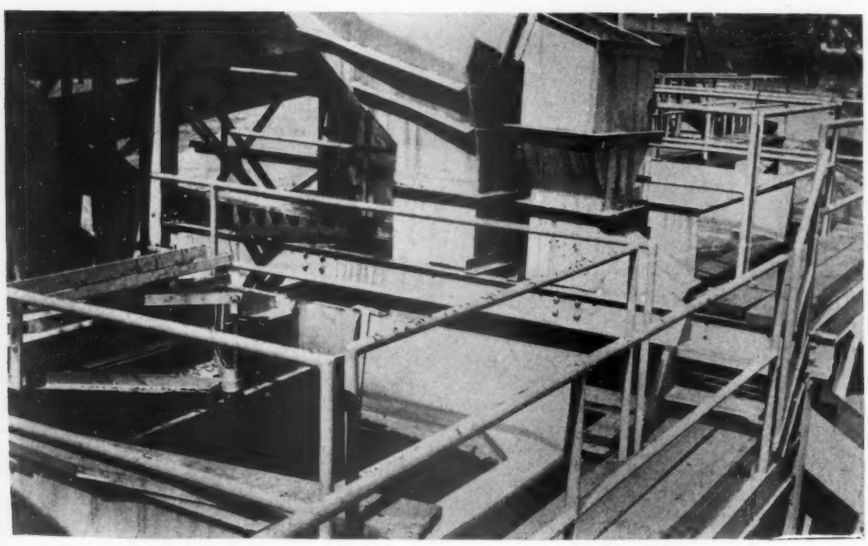
The St. Louis specifications call for the following percentages of the various sizes of gravel for the so-called "Class A" material:

2 -in.	95-100%
1½-in.	75-95%
¾-in.	35-60%
⅜-in.	5-20%
No. 4	0-5%

For "Class B" material the following percentages and sizes are called for:

1 -in.	95-100%
¾-in.	65-80%
⅜-in.	15-40%
No. 4	0-5%
No. 8	0-2%

These sizes are all based on screens having square openings.



Installation of sand cones for dewatering the sand

Inflammability of Coal and Other Dusts

THE work of the Bureau of Mines in determining the explosibility of coal, grain and other dusts is described in Bulletin 365, recently published by the Bureau of Mines, U. S. Department of Commerce. The laboratory methods used by the various investigators are described.

At first, tests were made in closed systems, measuring the pressure produced by the inflammation, but later it was found that more satisfactory results could be obtained by the laboratory furnace, measuring the extension of the flame of the igniting source or the required additional inert dust to prevent flame extension.

As one result of these investigations rock dusting has been used very effectively in coal mines to reduce explosions and save lives.

Composition of Granitic Pegmatites

A DEFINITE correlation has been found to exist between the number of minerals present in granitic pegmatite veins and the number of their constituent elements; in the normal pegmatitic process the number of elements equal the number of minerals, with but plus or minus 2 deviation. This applies only to pegmatites of Goldschmidt's mineralogical phase rule, A. E. Fersman reports.—*Chemical Abstracts.*

Centralized Control of Widely Distributed Crushed Stone Plants

Operations of the General Crushed Stone Company (Continued)

By Earl C. Harsh
Associate Editor, Rock Products

AT THE Geneva, or Oaks Corners, plant 5-yd. side dump cars and steam locomotives are used in the quarry. The rock is dumped to a 30-in. gyratory crusher which discharges to a 40-in. inclined belt conveyor carrying to a surge bin. From this bin the material is fed by a 42-in. pan conveyor feeder to a second 40-in. inclined belt conveyor which carries up to the top of the plant.

The sizing of the stone is done by a total of 10 Niagara double deck vibrating screens as shown on the accompanying flow sheet.

During the past winter arrangements were made to wash the stone at the loading point. This is done effectively by high pressure jets directed against inclined screens (3/16-in. slotted holes) in the loading spouts.

A 1000 g.p.m. pump supplies water for washing. The wash water and fines flow to a sump from which they are pumped to a sand settling tank and most of the product disposed of for mixing with sand. L. M. Croll is superintendent.

Auburn Plant

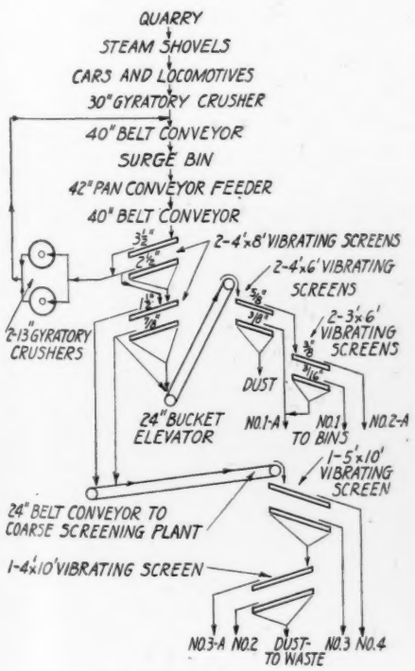
The Auburn, N. Y., plant was entirely rebuilt by the Rock Cut Stone Co. in 1917, but quite a number of changes have since been made in the screening and handling arrangements. Side dump cars of 4-yd. capacity and steam locomotives are used in the quarry, dumping to a 30-in. gyratory crusher located below the quarry floor.

From this primary crusher the stone is carried up on a 30-in. by 300-ft. inclined belt conveyor to a 50-ton surge bin. Below the surge bin a 36-in. pan conveyor feeder regulates the flow of material to a 4- by 8½-ft. single deck Robins "Gyrex" vibrating screen which acts as a scalper.

The oversize material falls to one 10-in. and one 13-in. Traylor gyratory crusher for further crushing, while the material passing through the screen is carried on an inclined belt conveyor to two parallel 3- by 6-ft. double deck Niagara vibrating screens. These screens remove the minus ¼-in. material which is carried up to a dust bin by a small bucket elevator.

The material from the recrushers is handled by a short belt conveyor and elevator to one 4- by 8-ft. double deck Robins "Gyrex" vibrating screen, any oversize being spouted back to the crushers and the dust carried

General view of Auburn plant from quarry floor



Flow sheet of Geneva plant

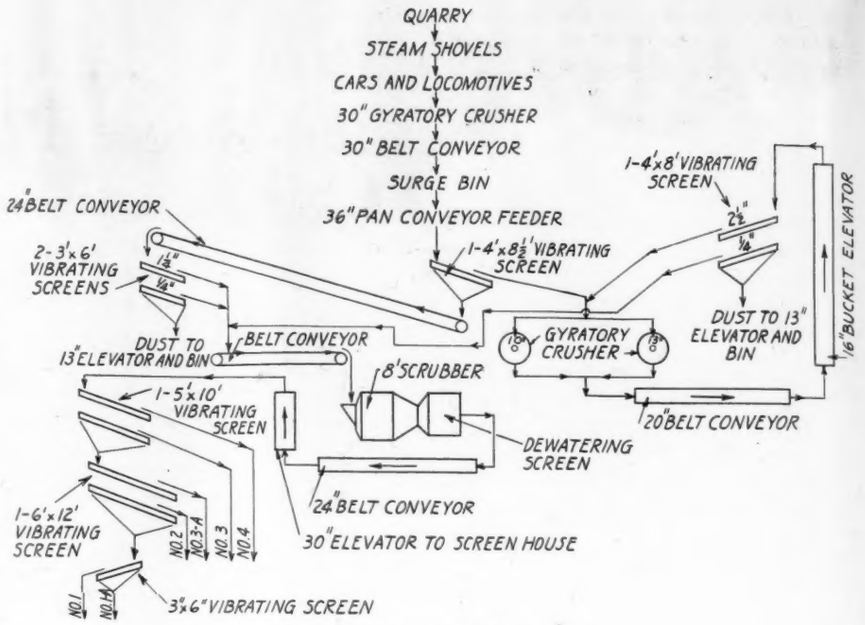
Partial view of the Geneva plant

up to a bin by the elevator just mentioned.

At this point an 8-ft. Hardinge scrubber has been installed to wash all sizes except the minus ¼-in. material. The scrubber is located adjoining the recrushing plant and the stone is fed to it and returned from it by belt conveyors.

This scrubber is a Hardinge conical mill equipped with flights inside the drum and a 6-ft. dewatering screen of perforated metal attached to the discharge end. It is revolved at a speed of about 22 r.p.m. and requires approximately 90 to 100 hp. when fully loaded. Some water is added at the feed end and high pressure sprays are directed against the stone in the dewatering section. A 550 g.p.m. Cameron centrifugal pump with 40-hp. motor furnishes water.

The washed material is carried up to the screen house above the loading bins by a 30-in. by 66-ft. belt bucket elevator which discharges to a 5- by 10-ft. double deck Robins "Gyrex" screen. This screen separates out two sizes, the throughs falling to a 6- by 12-ft. Robins "Gyrex" screen which separates out three smaller sizes. W. J. Weimer is superintendent.



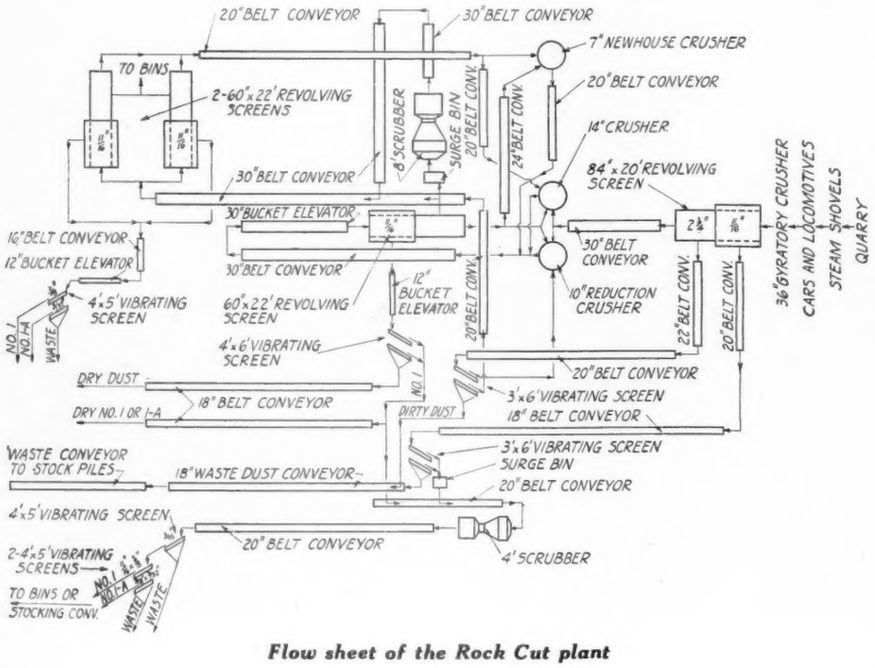
Flow sheet of the Auburn plant

Rock Cut Plant

At Rock Cut the quarry is at a level above the plant. Steam locomotives and side dump cars of 5-yd. capacity are used in the quarry, dumping to a No. 18 Allis-Chalmers gyratory crusher. The crusher discharges directly to a 7-ft. by 20-ft. revolving scalping screen where a first separation is made into two sizes as shown on the accompanying flow sheet.

The oversize is conveyed to two recrushers (10-in. and 14-in. gyratory) in closed circuit with a 5-ft. by 22-ft. revolving screen. The coarse material (2¾-in. by 11/16-in.) from the primary scalping screen is conveyed to a 3- by 6-ft. double deck Niagara vibrating screen for further cleaning and separation. Here it joins the recrushing circuit, while any minus 11/16-in. material is conveyed to three Hummer screens which separate out the No. 1, No. 1A and dust. The minus 11/16-in. material from the primary scalping screen is conveyed to a 3- by 6-ft. Niagara double deck screen where a similar separation is made. A 7-in. Newhouse crusher is also used for recrushing.

Sizing of the coarse material is done in two 5-ft. by 22-ft. revolving screens above the bins, the minus 11/16-in. material being conveyed and elevated from the dust jacket of the revolving screens to a double deck Hummer screen for the separation of the fines. Excess dust is carried by a series of belt conveyors to waste or to stockpiles.



Flow sheet of the Rock Cut plant

Two washers have just been installed at this plant, one an 8-ft. Hardinge scrubber (the same as at the Auburn plant) for the coarse material, and a 4-ft. Hardinge scrubber for the fine material (minus 11/16-in.). These are cut into the circuit as indicated on the flow sheet.

This plant is rather complicated but is also very flexible so that almost any product can be obtained. It is motor driven throughout, using purchased power. Guy W. Faylor is superintendent.

Watertown Plant

This plant, which was built in 1918 and purchased by the Rock Cut Stone Co. in 1928, is a simple and efficient operation, requiring few men.

In the quarry two 1½-yd. Marion electric shovels load to trucks which dump to a 36- by 48-in. Traylor jaw crusher. The quarry haul is about 850 ft.

From the primary crusher the stone is carried on a 30-in. inclined belt conveyor to a 4- by 6-ft. single deck Niagara scalping screen. Recrushing is done in a 14-in. gyratory crusher in closed circuit with the scalping screen.

The crushed material is then fed from a hopper by a 24-in. apron feeder to a 24-in. bucket elevator which carries it up to a 6- by 12-ft. Robins screen and a 5- by 10-ft. Niagara screen for sizing. Two 4- by 5-ft. Hummer screens are also used and a 6-in. Traylor reduction crusher. The operation includes an agricultural limestone plant with a Bradley three-roll mill and bagging machine. H. R. Cox is superintendent.

Little Falls Plant

At the Little Falls, N. Y., plant steam locomotives and cars containing two 7-yd. pans are used for quarry haulage. The rock is dumped to a 66- by 84-in. Traylor jaw crusher which is interesting as being one of

the largest crushers of this type in the crushed stone industry. From the primary crusher the rock is carried by a 42-in. pan conveyor and 48-in. belt conveyor to a 5- by 10-ft. single deck Niagara screen, from which the oversize is returned to the recrushers. Recrushing is done in a No. 9 McCully gyratory and a 10-in. Newhouse crusher. The Newhouse crusher was the first to be mounted on coiled springs instead of being hung from steel cables.

Sizing of the coarse material is done in a 7-ft. by 24-ft. revolving screen (to be replaced by vibrating screens) and the fines are handled over a double deck Hummer screen. Frank E. Taylor is superintendent.

Winchester Plant

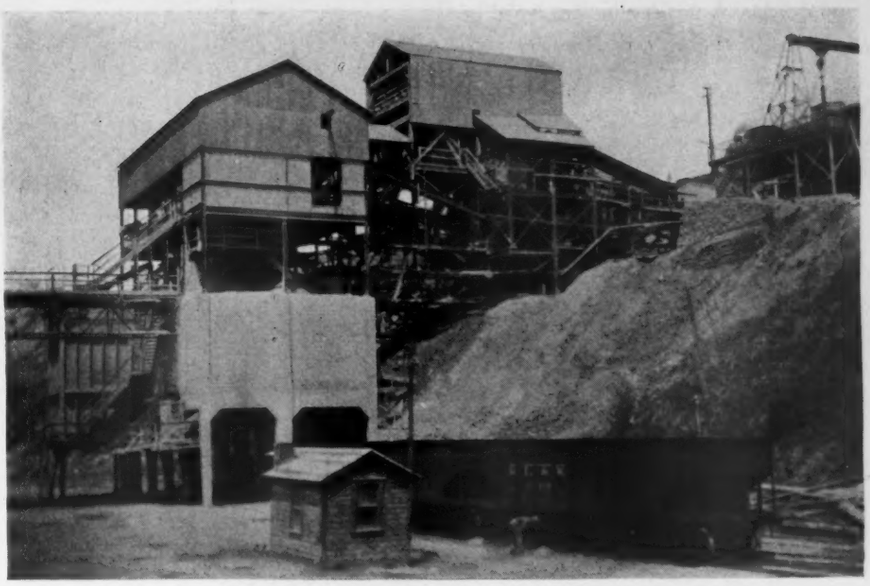
At the Winchester, Mass., plant the rock is hauled from the quarry to the plant, a distance of about 600 ft., in trucks which are dumped to a pan feeder ahead of a 42- by 48-in. Traylor jaw crusher.

Secondary crushing is done with four crushers, one No. 8 gyratory, one No. 6 gyratory, one 10-in. Traylor TZ type gyratory and one 4-ft. Symons cone crusher.

Sizing is done with two 5- by 8-ft. double deck Niagara screens, followed by two 4- by 8-ft. double deck Robins screens. The sizing of the minus 5/8-in. material is done over a 4- by 6-ft. Robins screen and two Hummer screens. M. V. McKeon is superintendent.

White Haven Plant

Trucks are also used for quarry transportation at the White Haven, Penn., plant, the length of haul being about 500 ft. Primary crushing is done in a 42- by 48-in. Traylor jaw crusher and the crushed rock is carried on a 36-in. inclined belt conveyor to a revolving scalping screen. Two No. 6 gyratory crushers, one No. 8 gyratory, one 5-15 Traylor reduction crusher and one Symons disc crusher are used for recrushing. The material is then carried up by bucket elevator to a battery of Niagara vibrating screens consisting of two 5- by 10-ft., one 4- by 8-ft., two 3- by 8-ft., and one 3- by 6-ft. screens. E. W. Faylor is superintendent.



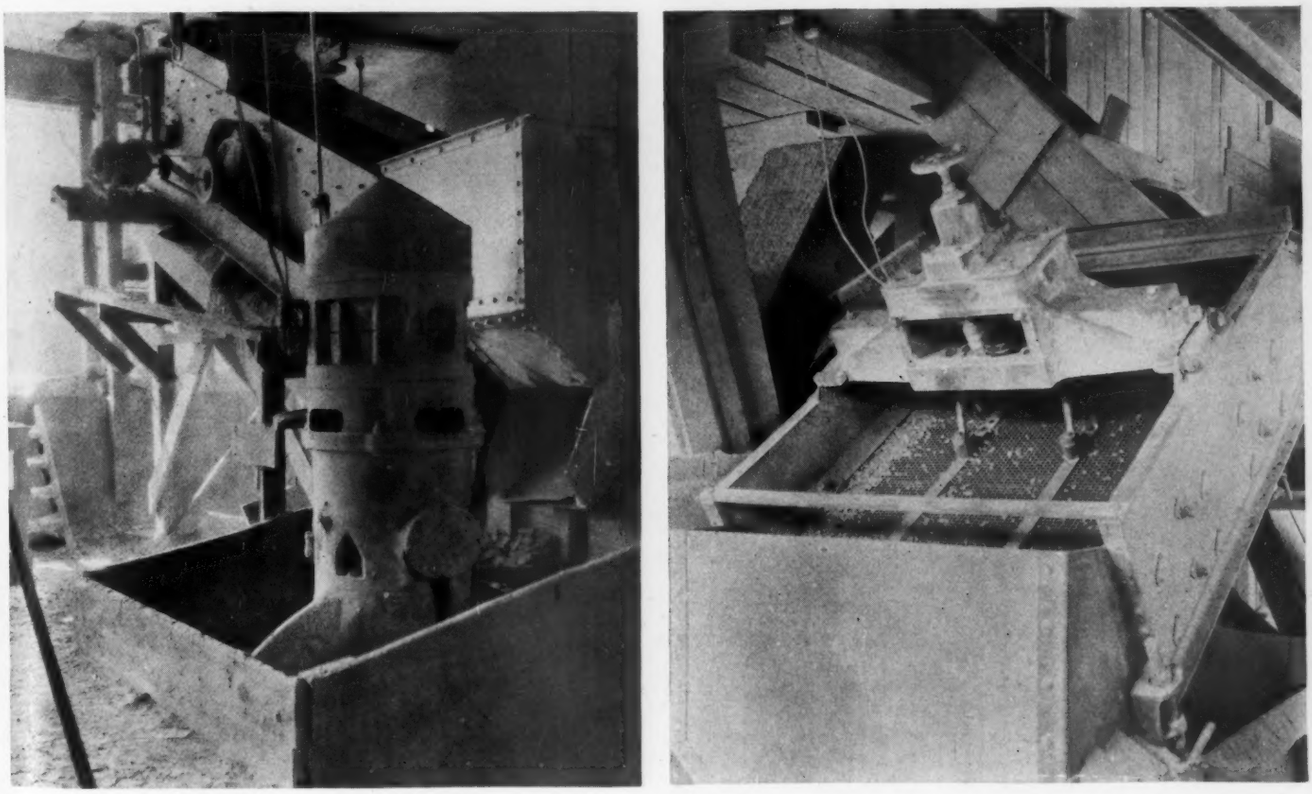
View of the Rock Cut plant, primary crusher above at right

Rock Hill Plant

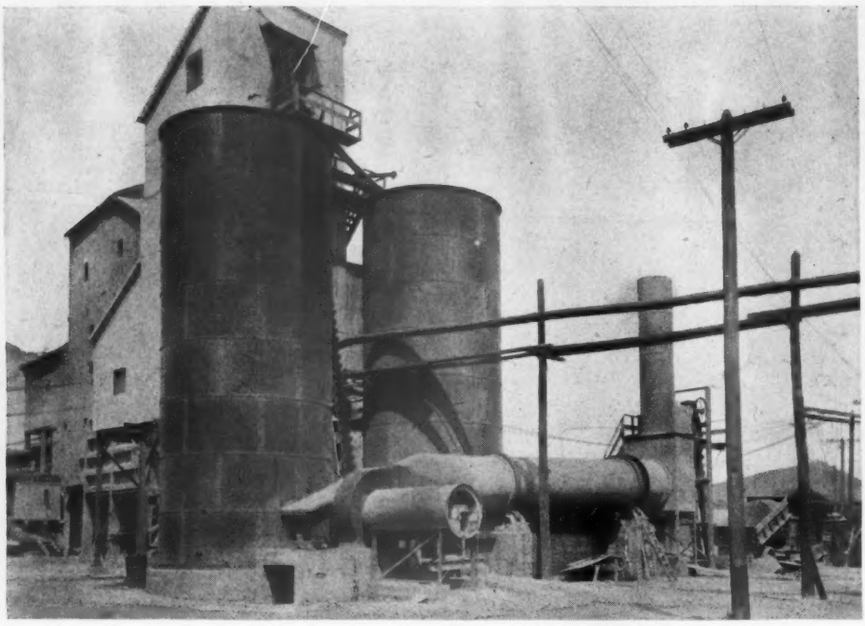
Because of the difficult drilling and shooting at the Rock Hill, Penn., plant tunnel blasting was tried out and has proven more satisfactory than the blast hole method.

Quarry transportation at this plant is by trucks over a distance of about 1000 ft. The trucks are dumped to a 48- by 60-in. Traylor all-steel jaw crusher which is driven by a 200-hp. General Electric motor.

The crushed rock is carried by a 48-in. belt conveyor to a stationary grizzly with 10-in. holes, from which the oversize falls



Spring-mounted crusher and scalping screen at Little Falls and, at right, vibrating screen for finer sizes



Black top plant at Winchester with crushing and screening plant beyond

to a No. 10 gyratory crusher and the throughs are conveyed to a second grizzly with smaller holes located above a Traylor Type-TZ 5-15 gyratory crusher.

The material from all three crushers is carried up by a 36-in. bucket elevator to a battery of four Niagara double deck vibrating screens. The elevator discharge is to a 5- by 10-ft. screen from which any oversize is returned to the 5-15 recrusher. The intermediate size passes to a 5- by 8-ft. screen which separates out two coarse sizes. The throughs from both screens are conveyed to a 4- by 10-ft. screen followed by a 4- by 8-ft. screen, these two screens separating out dust and three other sizes. P. H. Jacoby is superintendent.

Glen Mills Plant

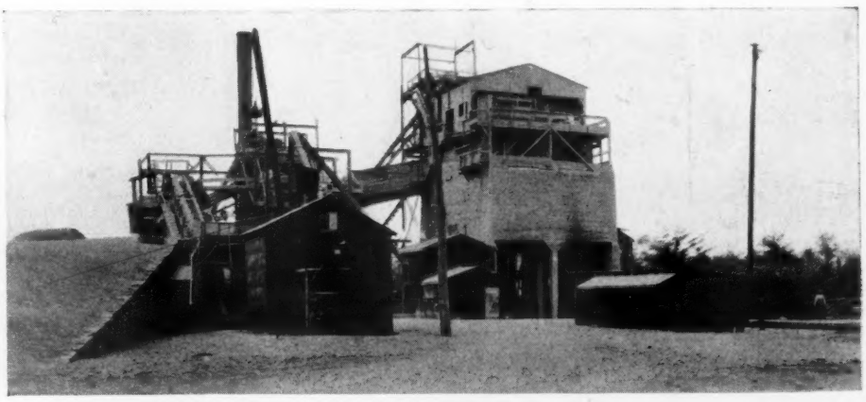
At the Glen Mills, Penn., plant a 3-yd. Bucyrus electric shovel is used for quarry loading and trucks for quarry transportation, the hauling distance being about 1200 ft. The trucks are dumped at the primary crusher to a short pan conveyor feeder which discharges to a 42-in. by 48-in. Traylor jaw crusher.

The crushed rock is then carried by a 48-in. bucket elevator to a 5- by 10-ft. double deck Robins "Gyrex" vibrating screen, where the oversize is scalped off to a 5-15 type-TZ Traylor gyratory crusher. The product from this recrusher is elevated to a 4- by 8-ft. single deck Niagara screen and the oversize returned to the same crusher, making a closed circuit at this point. A 4-ft. Symons cone crusher located alongside the Traylor crusher is also used for recrushing, being fed by a belt conveyor from the bins.

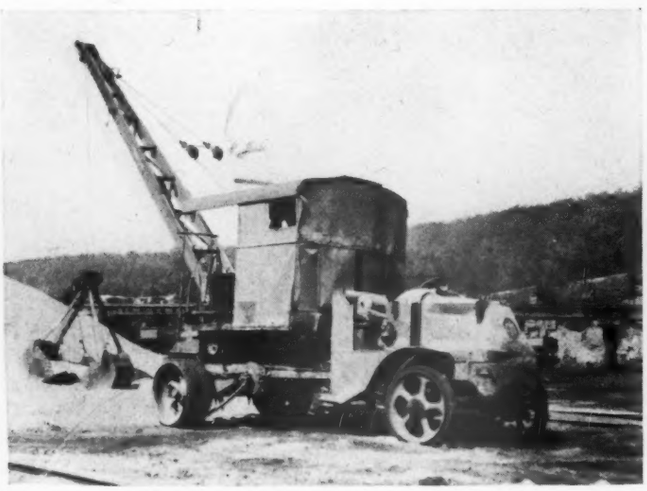
The throughs from both screens are carried by a 36-in. chain bucket elevator to the sizing screens above the bins, where the material passes first over a 5- by 10-ft. double deck Niagara screen and then over a 4- by 6-ft. double deck Niagara to separate out four sizes. The fines passing through the lower deck of the first screen are elevated to two parallel 4- by 8-ft. Hummer screens which separate out dust and two small sizes.

This plant was electrified in 1930 and the various units are driven by individual motors with push button control for all except the larger motors. The primary crusher was installed new at that time and is belt driven by a 200-hp. General Electric slip-ring motor.

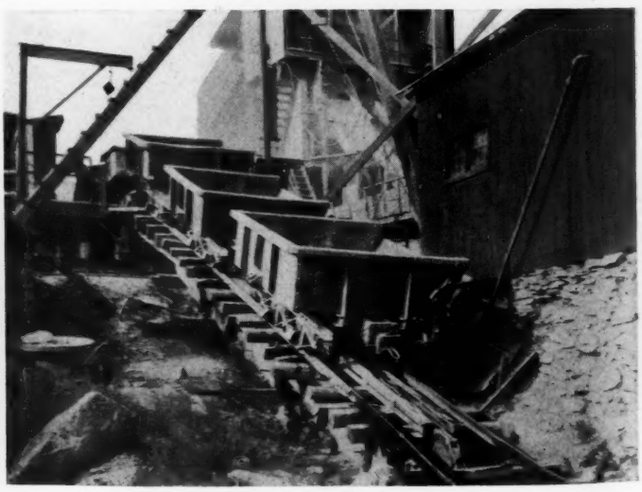
Considerable secondary drilling and shooting has been necessary at this quarry be-



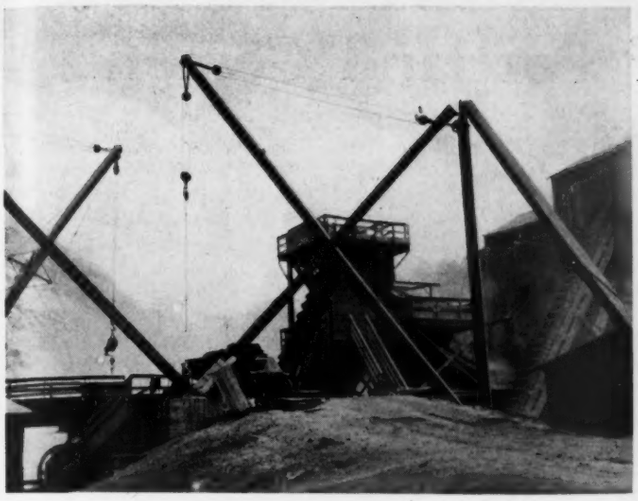
General view of the White Haven plant

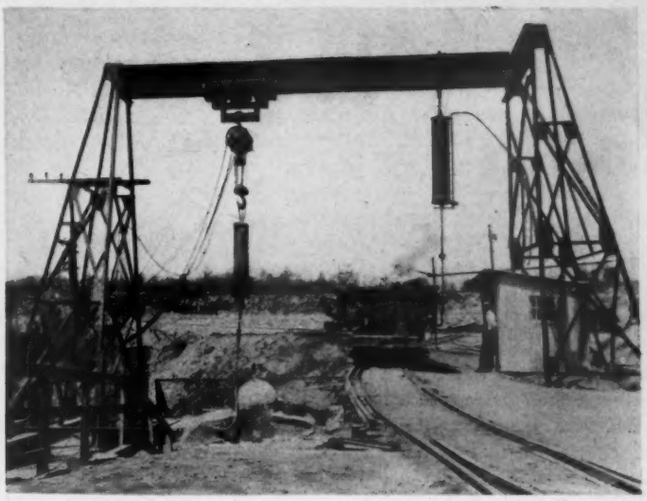


Universal crane as used at the Little Falls plant

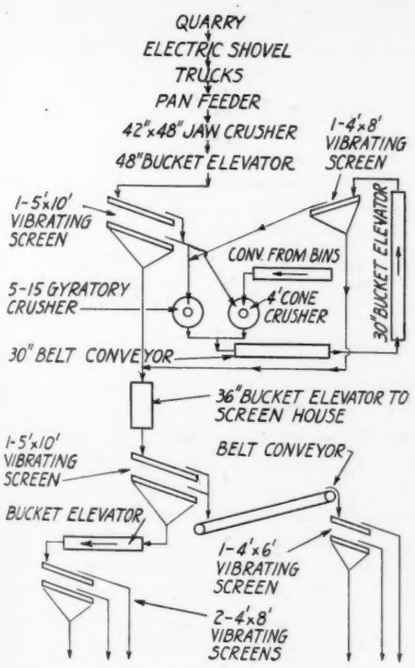


Car haul used at the Geneva plant





Derricks used at primary crusher of Glen Mills plant and, at right, air hoists at Rock Cut plant



Flow sheet at Glen Mills plant

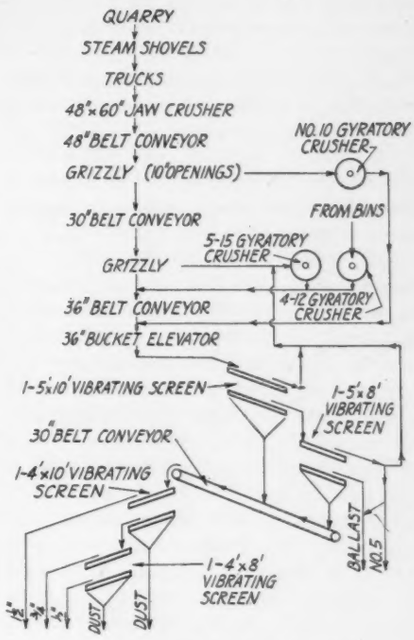
cause of the hard tough nature of the trap rock. Air drills are used for this, the necessary air being supplied by an Ingersoll-Rand two-stage compressor with direct connected 225 hp. General Electric synchronous motor. The drill bits are taken care of in an Ingersoll-Rand air-operated sharpener. E. E. Dotter is superintendent.

General

At all plants excess material is stockpiled either by drawing from the bins to trucks and hauling out or by drawing to railroad cars and stockpiling by crane and clamshell bucket. Locomotive cranes are used for this and for reloading at most of the plants. Five truck-mounted Universal cranes are also used, one each at Auburn, Rock Cut, Little Falls, Geneva and Rock Hill.

Each plant has a shop in which all ordinary repair work can be done. Oxy-acetylene equipment is used for cutting at each plant and four electric welding outfits are used for welding.

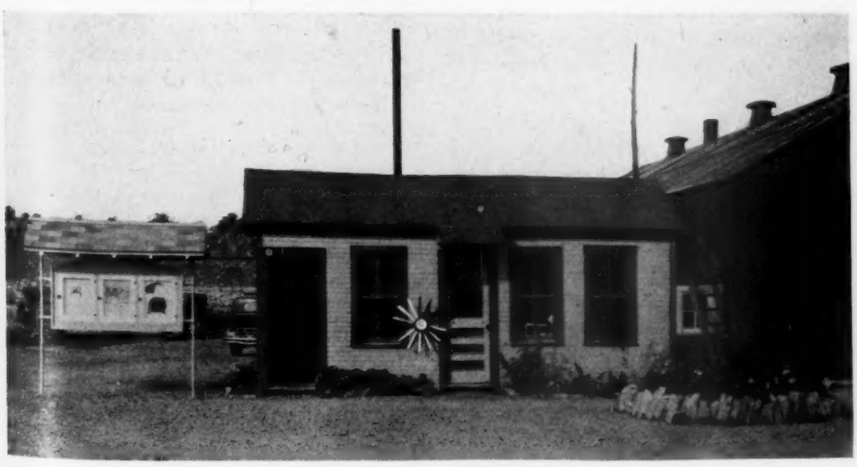
Safety work and accident prevention is an important feature at all plants, this being under the direction of H. F. Yotter. Regu-



Flow sheet at Rock Hill plant

lar meetings are held and reports and records kept covering these activities and the value of proper safety measures is constantly stressed by means of posters and in other ways. As an example of this, one of the illustrations shows in part how this is done at the Rock Cut plant.

The main offices of the company are at Easton, Penn., with branch offices at Syracuse, Rochester and Philadelphia. John Rice is chairman of the board; Otho M. Graves, president; H. H. Mitchell, A. G. Seitz and John Rice, Jr., vice-presidents; Redington Moore, secretary-treasurer, and F. W. B. Pile, assistant secretary-treasurer. A. G. Seitz is in general charge of operations and John Rice, Jr., in charge of sales; F. S. Jones is general superintendent over the Pennsylvania, Massachusetts and western New York plants, and F. F. McLaughlin at Syracuse over the central New York plants.



Quarry office at Rock Cut plant showing safety promotion methods

The Manufacture of Portland Cement*

Part VIII—Components of Cement

By S. E. Hutton
Consulting Engineer, Seattle, Wash.

LIME (CaO) is the principal component in cement, forming 59 to 67% of it by weight. It must be present in sufficient amount to form tetracalcium alumino ferrite with the iron oxide and a part of the alumina, tricalcium aluminate with any alumina in excess of that required in the iron-alumina-lime compound, and, with the silica, dicalcium silicate and tricalcium silicate in ratios varying from about 1:3 to 4:3.

Varying the percentage of lime in a cement mix, without varying the relations between other components, raises or lowers the total silicates. These effects may be seen by comparing the calculated analyses of cements made from different proportions of the same raw materials, as given in Tables III and III-A, Part V. An increase of 1.75% in the lime content, at the expense of the clay components, reduced iron oxide and alumina, and therefore the alumina compounds in the cement, thereby increasing the total of silicates present. Since less silica is present in the second cement to combine with more lime than in the first, the second cement must be higher in tricalcium silicate. The most striking effect is the decrease in the ratio of dicalcium silicate to tricalcium silicate from 1:1 to 1:3.

An examination of the analyses given in Tables I, III, and III-A must make it clear that cements cannot be judged properly by considering only the percentages of lime present in them, and that the terms "high-lime" and "low-lime" are more or less meaningless except as they refer to high or low ratios between the tricalcium and dicalcium silicates present in any cement, or to high ratios of silicates to iron and alumina compounds.

High-lime raw mixes are often said to be hard to burn. This expression probably means that as lime is raised to provide for a greater percentage of tricalcium silicate in the clinker, more free lime is found in the clinker. The trouble may be due in part to failure to heat the clinker throughout to a sufficiently high temperature and long enough to form tricalcium silicate, which failure could occur with and would leave free lime in low-lime clinker, but it is probably due chiefly to the imperfect distribution of the components in the mix.

As the percentage of tricalcium silicate increases, that of dicalcium silicate, with which the last vestiges of lime must combine, decreases, so that fine grinding and distribution approaching perfection becomes increasingly important. Small quantities of the silica content of the raw mix, which are not ground fine enough to facilitate wide distribution and ready reaction, have a pronounced effect in making it difficult to hold free lime low in high-lime mixes.

With some mixes, suddenly cooled clinker might contain free lime derived from tricalcium aluminate, dissociated at high temperature and not reformed in cooling (P. C. A. F. Paper No. 22, pp. 61-3-5). High-lime raw mixes are said to give less clinker ring troubles and to produce easier grinding clinker than low-lime mixes.

The ratio of lime to the sum of silica, alumina and iron oxide should be between 1.9 and 2.2, but the value of such a ratio must not be regarded as a definite measure of the qualities of a cement, for it can have one value for an infinite number of combinations of the silica, alumina, and iron oxide components, and therefore of the constituents of a cement. With the acid oxide components present in a cement in substantially constant relations to each other, variation in such a ratio is almost a direct measure of variations in the tricalcium silicate content.

Silica

Silica (SiO_2) may form from 19 to 25% of cement. The percentage present depends partly upon the facts that alumina and iron oxide are beneficial in burning clinker, serve useful purposes in cement, and are unavoidable in raw materials, and partly upon the ratio desired between the dicalcium and tricalcium silicates in the cement. Raising lime and reducing silica in a mix increases the tricalcium silicate content and diminishes the dicalcium silicate content.

Silica may be the cause of much trouble in cement making. This is a consequence of the fact that the proper silica content of cement cannot be obtained entirely from silicates, such as kaolin and orthoclase, but must come in part from silicon dioxide (SiO_2) in the form of quartz, chert, flint, etc., which are present in clay and shale and frequently in limestone. Silicon dioxide is hard and, therefore, not generally reduced by natural forces to the fineness of the kaolinite and feldspathic materials in clay and shale, is more difficult to grind artificially, and reacts less readily with lime than do the silicates.

It is a question whether much, if any, silica above the 200-mesh screen size enters into any reaction in clinker burning. Failure to grind to extreme fineness the silica (SiO_2) content of a raw mix may cause undue insoluble materials and free lime to appear in clinker. High kiln temperatures are not a substitute for proper grinding and mixing. Silica sand is sometimes added to the kiln feed to reduce clinker ring troubles.

In general, it has been the opinion that the ratio of silica to alumina in cement was an indication of setting and strength characteristics, and should be between 2.5 and 5, but it is likely that this ratio is not a very reliable guide, for the percentage of iron oxide would affect all considerations. The ratio of silica to the sum of the alumina and iron oixde has been known to vary from 2 to 3.5 in good cements.

Alumina

Alumina (Al_2O_3) is a valuable and indispensable component of cement. With lime it forms the constituent which causes the setting of cement. If present above some undetermined percentage, tricalcium aluminate causes too rapid setting, unless a retarder, such as gypsum, is added.

In the kiln, alumina has a beneficial fluxing action which reduces the temperature at which the silicates form, but it also causes trouble by promoting the formation of clinker rings if present in excess of 7 to 7.5%. Iron oxide should probably be considered with alumina in this connection. Alumina may be necessary in clinker to prevent a change in dicalcium silicate from a non-dusting to a dusting form.

The total of alumina and iron oxide contents in good cements runs from 8 to 10%, alumina seldom being below 4%. The alumina-iron oxide ratio runs from about 3 to 1 to 2 to 1, in ordinary cements. In rare cases it is as low as 1 to 1, and occasionally 0.8 to 1. In the latter cases the content of tricalcium aluminate in the cement is low, and the cement is likely to show high resistance to sulphate waters.

Iron Oxide

Iron oxide (Fe_2O_3) is present in all portland cements to the extent of 2 to 5% of the total weight, except in white cements, of which it usually forms less than ½%. It is unnecessary, and is perhaps a detriment, in so far as strength is concerned, for silicates would contribute more to strength, but it is unavoidable in raw materials sufficiently cheap to be used in commercial cements, is beneficial in reducing the temperature of clinker formation, contributes the gray color which is valued in many applications, and may contribute to the durability of cement

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in sulphate waters by reducing the percentage of tricalcium aluminate in the cement.

Frequently it is necessary to add iron oxide, from iron ore, pyrite cinder, or slag, to highly siliceous raw mixes in order to make them sinter at reasonable temperatures. Present in excessive amounts, iron oxide increases kiln troubles through the formation of clinker rings and large, slow-moving masses of clinker.

Sulphur

Sulphur in cement may be due in part to its presence in the raw materials, or to combination of sulphur from the fuel with lime in the raw mix during burning, but it is present chiefly in the calcium sulphate as gypsum or plaster of paris, added to the clinker to control the setting time.

Iron pyrite (FeS), sulphates, and organic sulphur compounds are frequently present in limestone, clay, and coal. Operators using high sulphur coals frequently complain of its affecting the setting time of their clinker. Iron pyrite from coal occasionally passes through the kiln unoxidized, and causes yellow stains on concrete. There is some evidence that high sulphur contents in raw materials are not serious if present as sulphides, and subjected to oxidizing conditions in the kiln.

For controlling setting time, the SO_3 content of cement varies usually from about 1.50 to 1.75%. Two per cent. is permitted (A. S. T. M. Specification C9-30) in standard portland cement, and 2.5% in high-early-strength portland cement.

Magnesia

Magnesia (MgO) is present in many of the raw materials in cement making, and may compose 5% of cement (A. S. T. M. Specification C9-30), although greater percentages are not injurious, except as a diluent. Some of the magnesia may be combined with tetracalcium alumino ferrite, but it is dealt with as if it were present only as MgO. It is apparently inert in cement, but it is a valuable fluxing agent in the kiln.

The Alkalies

The alkalies, potash and soda, being components of some of the rocks from the disintegration of which clays and shales are formed, are present in the raw materials from which cements are made. The potash content of raw mixes varies from 0.2 to 1.2, averaging about 0.8%. Both are volatile at kiln temperatures, soda less so than potash, but some alkalies, usually less than ½% of either, are present in all cements. Soda has been found to reduce the temperature at which lime combines with silica and alumina, but its tendency to increase the viscosity of a slag to which it is added may check the rate of reaction.

Manganese Oxide

Manganese oxide (Mn_2O_3) is present in many iron ores, and is likely to appear in cements made from raw mixes to which iron ore has been added for the purpose of promoting clinkering, or of improving durability of the cement in sulphate waters. It is believed to react in much the same way that iron oxide does, and Guttman and Gille (*Zement* 1930, 19, No. 31) give as the formula of the cement constituent containing it: $4CaO{\cdot}Al_2O_3{\cdot}6Mn_2O_3{\cdot}4Fe_2O_3$.

It imparts a brown color to cement, but if not present in excess of 2% it is said to have no effect on other properties. Present in excess of 3%, it is said to raise the clinkering temperature.

Titanium

Titanium is probably present as a minor component in most cements, but there is seldom more than about 0.25% of it in the raw mix, and it is generally not determined. Its actions and effects are not known. It is found in the "insoluble residue" of many cements.

Phosphorus

Phosphorus, if present, probably enters the raw mix in "phosphate rock," the important constituent of which is calcium phosphate ($Ca_3[PO_4]_2$). This is frequently called tricalcium phosphate, written $3CaO{\cdot}P_2O_5$, and is considered a combination of three molecules of calcium oxide and one of phosphorus pentoxide.

At high temperatures, in the presence of silica, calcium phosphate is decomposed, yielding calcium silicate ($CaO{\cdot}SiO_2$) and volatilized phosphorus pentoxide (P_2O_5). If the reaction is not complete, insoluble dicalcium phosphate or soluble monocalcium phosphate may remain. Even very small quantities of the latter may retard or prevent the setting of cement. Cements with normal properties have been found to contain as much as 0.3% of phosphorus pentoxide.

Carbon Dioxide

Carbon dioxide (CO_2) and water (H_2O), which appear in cement analyses as "loss on ignition," are present in all cements. There may be less than 1% in freshly ground cement, and as much as 3 or 4% (the maximum permissible) in cement stored in sacks. Both are absorbed from the air, and affect especially the early strength of finely ground cements. High-early-strength cements are, consequently, shipped only in paper sacks, and should not be stored over long periods except in silos or air-tight containers. Cements made from aged clinker high in free lime run high in water or carbon dioxide, or both.

Carbon dioxide, as a gas or in solution in mixing water, and solutions containing sodium carbonate hasten setting.

(*To be continued*)

Progress of Building Research

DEVELOPMENTS in connection with building research carried out by the British Research Board in 1931 are reported in the annual report of the board, recently issued.

Activities include the investigation of weathering of building stones. This has proceeded and variability of structure can now be expressed in quantitative terms, and it is considered possible by simple laboratory experiments to determine the quality of a sample with a reasonable degree of accuracy.

In dealing with its work on cements the board reports that the last few years has seen considerable advance in the rate of development of strength of cements. With the exception of permeability this has not been accompanied by any corresponding improvement in other properties of cements which are of considerable importance. The report states: "Thus, the volume changes occurring in set portland cement concretes do not appear to have decreased, while the rate of evolution of heat on setting and hardening has increased. Although the latter may be advantageous in cold weather when dealing with thin sections of concrete, it leads in mass concrete to high internal temperatures and consequently to shrinkage movements on ultimate cooling." The report suggests that the trend in recent years in cement manufacture seems to have been dominated too largely by one factor—that of the rate of development of strength, without sufficient consideration of other factors.

In cooperation with the Cast Concrete Products Association an investigation is being undertaken with a view to the general improvement in quality of cast concrete products.

Investigation of the exclusion of dampness from the walls of buildings has also been studied. Preliminary investigation has been limited to mortar joints and methods of making them. Results indicate the penetration of water depends to a large extent on the capillary path through the structure. Breaks in this path seem advantageous. In most cases water has penetrated wall sections in portland cement mortar slightly quicker than those in lime mortar. Various waterproofing treatments are now being studied.

Other investigations include sound transmission and acoustical properties of construction.

Aluminum-Bearing Cements

AN EXAMINATION of the time-temperature curve shows that the evolution of heat in the setting of an Al cement occurs in three definite stages, and that the third stage may not occur if insufficient water is present. Thermal study gives a good indication of the time of complete set, but does not show when setting starts. The fact that the time of set is independent of the amount of water present indicates that the end of the setting is due to a sudden increase in the velocity of hydration after a constant period of induction.—*Chemical Abstracts.*

Progress in Kaolin Refining

As Practiced in the South Carolina and Georgia Districts

By J. K. Towers

THE DEVELOPMENT of methods to attain the highest possible standards in any process industry necessarily means that obsolescence of mechanical equipment must be charged off at a high rate and thus the complete return on the capital investment be accomplished within a short time.

Perhaps the one group in which this is true more than any other, is the chemical and its allied industries such as rock products. One need but go into the yards of the larger chemical companies to see mountainous piles of machinery, which in some cases has been in active use only a month, or a week or even a day—the price paid by these companies for reaching to new heights of processing.

Generally speaking, however, it may be said that "to the victor belong the spoils," and it is only by constant prodding, changing, experimenting and spending that the unusual and most profitable results come to pass.

The producers of kaolin are like many other rock products producers in this respect, that while process methods have been undergoing considerable change in the past ten years, the actual scrapping of any sizable or costly equipment has not yet been necessary.

It is true that all the various pieces of equipment are not in constant use and at one time or another there seems to be a switching from one method to another; nevertheless the idle equipment is far from being scrapped. It has awaited only the reversal back to the method in which it may be serviceable, which may occur at any time as it has previously.

Variation in Methods Result in Advancement

Stated in simplest form, kaolin processing like much other rock products processing comprises but three stages:

(1) Mining, (2) Drying, (3) Grinding.

Around all three, there is evident ramifications in the nature of equipment used, as one may understand by referring to the flow sheet herewith. Some of the differences result from the necessity of handling in a different way each physically different material, but, in the writer's judgment, the greater number of procedures are the result of individual theories, and the belief of each operator that his way is best.

With this spirit of endeavor in mind, one may visualize a day not far distant when obsolescence may appear so rapidly as to cause the discard of complete processes and equipment now employed. It may appear in the form of utilization of a far greater percentage of low grade material, now generally discarded for the richer veins. Already there is evidence of this in a measure by successful reclamation of tailings. This phase may develop a complete reversal from the dry to the wet process, or more rapid strides made in the combination of both. On the other hand there may be more advancement in dry separation to remove the foreign substances such as mica, silica (grit), etc.

The electrical precipitation of dust, effectively used in metallurgical, cement and other fields, indicates that it is not beyond the scope of imagination that it may be applied to kaolin refining.

The tendency of operators is to "go one better" than the other fellow. "Like sheep" is no more the policy. As an evidence of the extreme to which this is carried, it is known that one superintendent advised a representative of a machinery firm not to mention to the superintendent's executives that a competitor was using machinery of the same kind, or his opportunity of effecting a sale would be jeopardized.

Machinery Manufacturer's Share

No small share of the burden of the rapid development in this field, is borne by the machinery manufacturer. In many instances this has taken place not only in supplying the equipment and men for prolonged trial periods, but also in making good the losses suffered through inadequate design, underestimated sizes, and in some cases the complete loss by the return of the equipment.

It is generally felt that some producers have taken advantage of the equipment manufacturer because of his lack of knowledge of the unusual characteristics of kaolin. Equipment suppliers need only thank themselves for this, because they so shaped guarantees as to become involved in a project in which there is no knowledge of all intricacies. They can, therefore, merely charge these losses to new experiences and development.

Causes for Variations or Applications of Different Equipment, Etc.

What is the underlying cause that brings about the constant application of new ideas and arrangements? Primarily it is the one of trying to meet the ever increasing demands of the purchasers of refined kaolin. Their standards in some instances have been established by the character of product they may have received from one particular supplier. Another supplier then comes in with an advantage from another angle. For instance, one finds his kaolin has excellent application to a certain work, possibly because it shows up greater in desirable acidic qualities, but the per cent of silica (grit) is high. Another finds his product just the reverse.

The course of procedure, in the first case, is to arrange equipment to reduce the grit content, which brings in the problem of greater waste of kaolin in the tailings or in processing the tailings to reduce this loss.

In the other case, the producer is faced with higher cost because of the necessity for adding a substance to counteract the alkalinity of his material or to tone the color of it.

It is not the intention here to present the ramifications involved in the marketing of this material, although there may be many. Rather, it is to give an insight into the complexities and variations alone involved in processing.

Subdivision of Changes Occurring

Following the course of events by a study of the flow sheet on "Evolution of Processing Kaolin," we find there are several phases of changes in each of the three stages previously mentioned.

Stage 1.—*Mining.*
- Phase A—Hand mined to trucks or cars.
- Phase B—Power shovels (gasoline, steam or electric).
- Phase C—Dragline scraper (on overburden only).

Stage 2.—*Drying* (or dewatering).
- Phase A—Shed or racks (natural air or steam coils).
- Phase B—Rotary (indirect heat, natural gas and coal with hand or stoker firing).
- Phase C—Filtering—dewatering and thickening (plate presses or vacuum continuous type filters).
- Phase D—Tunnel (natural gas firing).

Stage 3.—*Grinding* (including primary crushing and air separating).
- Phase A—Crushing rolls (single- and two-stage).
- Phase B—Roller mills (with integral air separators).
- Phase C—Hammer, cage mills and buhr stones (with detached centrifugal air separators).

Drying, a Big Factor

It is fully recognized that the heart of the processing is the drying operations. If the material is to be shipped in bulk it is

desirable, and usually specified by the purchaser, that it be partially dried; if it is to be ground to grain size, the degree of drying required is greater; and if it is to be finely pulverized and air floated, this can best be done by drying to the lowest limits. Again, if the material is disintegrated or ground or classified in water to remove the foreign products, the fine wet kaolin or slip must be dewatered and finally dried for further disintegrating and air floating.

As a consequence of the relation drying bears to the rest of the process, it has been a subject of considerable study and some experimenting.

It is significant that the indirect heat dryer has maintained a position it established for itself since the first application of it, in these districts, was made thirteen years ago.

The present installed capacity of this type is something like 700,000 tons annually, depending on the degree of drying practiced. This represents about 70,000 tons average for each producing company. It is believed that only one company exceeded this average last year, but this included material handled from that part of the plant not using the rotary dryer.

Of necessity and where applicable numerous proven devices known to the engineering profession have been applied to the dryers to give the highest efficiency—the double passage of gases indirectly through the dryer for maximum heat utilization, temperature control, speed variations, adjustable rate mechanical feeders, automatic firing either through stokers on coal or control elements where natural gas firing is used, and by-pass conveyors to enable the dryers to operate at maximum load even where it may be necessary to return dried unground kaolin to storage should grinding capacity not be equal to the drying capacity.

Rotary Dryer a Pioneer

The rotary dryer might well be considered the pioneer in paving the way from darkness to light in this industry. Prior to acceptance of it for this work, there was a hopeless effort to combat the competition of foreign markets. Increased production and an assurance to the purchaser that his requirements could be met without respect to weather and other uncertainties and still maintain high standards of quality firmly established American producers in the confidence of the buyers.

Where previously a week was required to dry a given quantity of kaolin from pit-run moisture of about 23% down to 6% or 7%, rotary dryers now readily dry to under 2% in fifteen minutes. Needless to say, all the acreage in low priced leasing property, and the most inexpensive type open rack air drying, would not justify such a procedure today for complete drying of the kaolin. One producer who saw the light of this only as recently as a year ago, has stated that he would now be out of business, were it not for the installation of a rotary dryer.

I am sure that if the established producer were asked what one piece of equipment he considers has made it possible for all other stages of advancement, he would refer to the rotary dryer. In the wet process this may not be so generally accepted as in the dry, but it is true nevertheless, since the rotary indirect heat dryer is applicable in either case.

Grinding Presents Greatest Number of Departures

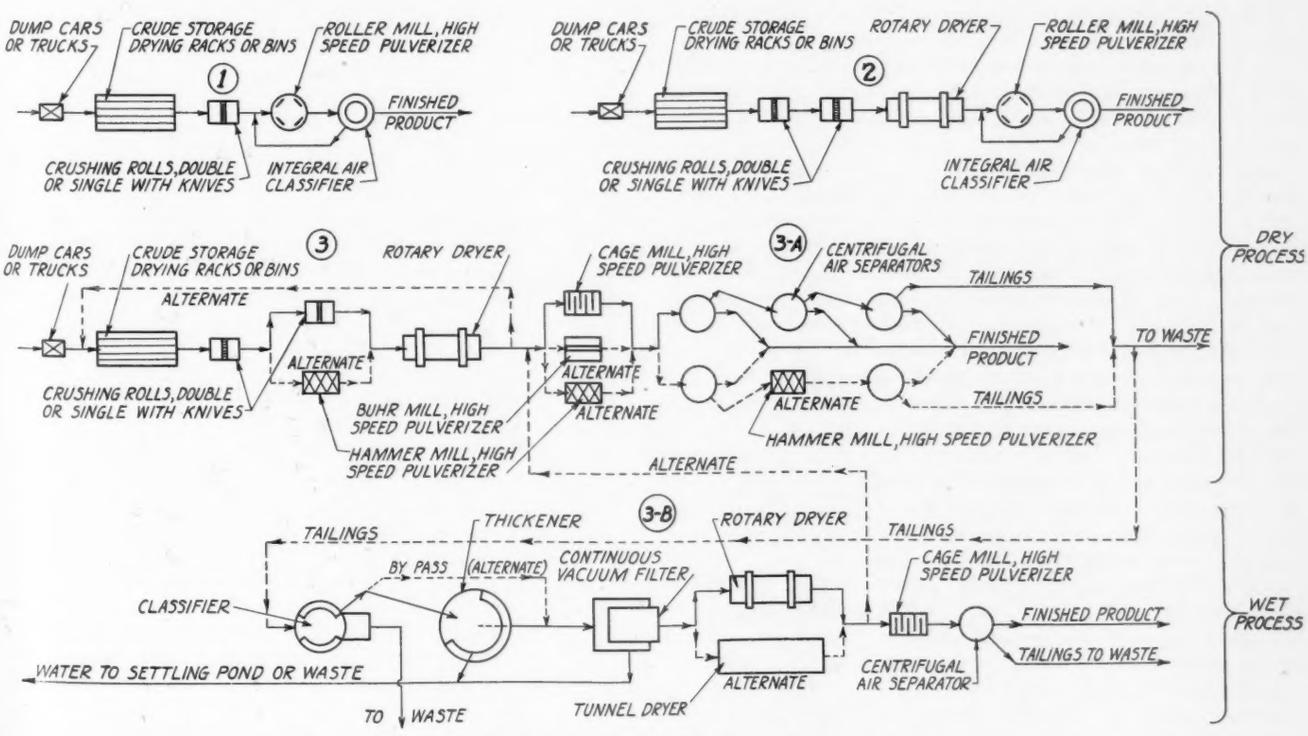
Referring back to the three stages: Mining, drying and pulverizing—a study of the flow sheet will readily reveal that the greatest number of variations in types and makes of equipment obtains in the grinding stage. Primary crushing, if considered along with pulverizing, is an exception to this. Here the simple double-roll crusher with cutting blades is used entirely except in one instance, to the writer's knowledge, where the hammer mill is used as a secondary crusher. It is obvious that on the very wet plastic kaolin, particularly as a primary unit, the hammer mill is out of the question. On the harder kaolins, however, and as a secondary mill, the results are good. The rather high power consumption is mostly offset by the greater tonnage per unit obtainable.

Two or three operators practice single-stage crushing with double rolls. The others use two sets, giving a feed product to the dryer of about 1 in. in the greatest dimension. The compactness of the kaolin is a factor, and frequently slabs of kaolin up to 4 in. long are observed in the discharge from the second set of rolls. It is obvious that on such kaolin the hammer mill would not prove satisfactory.

Air Separators Important Part of Units

In further thought of the grinding phase, it is desirable to consider air separation at the same time. This is for the reason that in some of the equipment the air separator is an integral part of the grinding unit.

The first application of fine grinding units was in the use of the roller mill with air separator attached. This involved the hand



Flow sheet of kaolin processing

selection of only the finest grit and mica-free kaolin for pulverizing, since the tailings were recirculated and continuously ground and floated into the finished material. Some pits make it possible to still use this type. It is evident the costly procedure justified the expense of the equipment for treating lower grades. This resulted in the use of the centrifugal type air separator, which provides means for rejecting the tailings. The high speed attrition mill, of which there are several types, although not a fine grinding mill in itself, readily found favor when used in conjunction with the centrifugal air separator. Fairly high capacities on this relatively soft and non-abrasive material are possible at reasonable maintenance and power cost.

One General Principle But Numerous Variations in Details of Design

Following the first installation of this system, there was rapid action on the part of the different companies to fall in line, with a tendency to modify or extend the principle farther by departing from the same layout and particular make of equipment used by competitors.

It is interesting to note, in this connection, that there are at least six different makes of pulverizers, including a homemade device, and three different makes of air separators in use.

Further disintegrating of lumps formed by filters in the handling of the tailings through the wet system is necessary. Either separate grinding mills may be used or the material again passed back through the mills and air separators in the existing dry process.

Drying—Rack Type

In the drying process the original installations were entirely open rack storage with roofs for protection against rain. A few small producers still follow this procedure, although in all of the plants provision is made to give some air drying where conditions justify it. The more elaborate storage of this class provides loose slats on which the large kaolin lumps are piled to give the best air circulation possible. In one plant storage for 20,000 tons is provided by numerous tiers of slats supported on cross walls at intervals in the length of the shed. A concrete sloping floor permits of a ready slide of kaolin dumped from the racks, as the drag conveyor, operating in a trough at the bottom of the slope, draws the kaolin away to crushers. Other arrangements provide for a belt or a drag conveyor operating in a tunnel under the floor, which is loaded by the removal of cross boards over the tunnel on which the kaolin is piled, as the reduction in the supply dwindles away toward one end.

Steam pipes inserted under the racks in numerous rows, are still used in some plants, but these were installed primarily to dry the filter-press cakes which were piled on the racks in the older wet process plants. Some experiments were carried on by forcing hot air from a fan and heating chamber through the racks, but this proved almost useless.

Tunnel Type

Tunnel drying is practiced only when the physical properties of a material obviate the possibility of using the rotary dryer. For this reason it has naturally been applied only to the wet process. It is, in a sense, the successor to the steam-coil, rack-drying system, except that it is of an enclosed type and that mechanical movement of material through the dryer is used, and heating elements other than steam may be applied. The heating efficiency is low, principally due to the maintaining of a bed of material that is not in constant agitation or turning over. Twenty-four hour operation is almost a necessity for reasonable results, since any prolonged periods of shut-down may cause excessive fuel consumption to bring the great amount of refractory surface up to suitable drying temperature. There is also a possibility of high refractory maintenance due to contraction and expansion as a result of intermittent operation.

Filtering and Thickening

Filtering and thickening are not distinctly drying operations. They are essentially mechanical means of dewatering without heat. Applied only in the wet process, they relieve the dryers using heat of considerable burden. The lowest limit of moisture in the discharged product is from 25% to 35%, depending on whether continuous vacuum or plate-press type filters are used, as well as the character of slip handled.

Thickeners are usually applied as primary dewaterers ahead of the other filters and are mechanically equipped settling ponds.

Rotary Dryers

The rotary dryers are of the indirect heat type in which the gases of combustion from the furnace do not come in contact with the product during drying. The strict requirements of the kaolin purchaser demands this procedure. One feature of design provides for a greater suction in the gas chamber than in the drying chamber, the control of which is governed by separate exhausters. Should any possible undiscovered leak occur around a rivet or joint, the gases would not enter the drying chamber and discolor the kaolin, although a slight amount of fine dust may be drawn into the gas ducts and thence discharged through the fan. The principle of operation is clearly shown in the illustration of the dryer.

A temperature drop of from 1700 deg. or 1900 deg. F. of the incoming gases to 250 deg. F. for the fan discharge, indicates the effectiveness of the heat utilization, allowing for normal losses by heat in the product discharged and otherwise.

Average fuel consumption per ton of crushed crude kaolin, over any 24-hour daily operation, and when drying from about 23% to 1% moisture, is 95 lb. of coal. This includes normal losses in drawing fires, etc., for a hand-fired unit. At $4.50 per ton of coal delivered the fuel cost would be 21.3c. per ton of dried kaolin. An equal cost in natural gas would result, if 1500 B.t.u. per cubic feet gas costing 25c. per 1000/c.f.m. is used or 1200 B.t.u. gas costing 20c. per 1000/c.f.m. Power consumption is safely figured at 4½ kw.h. per ton for dryer shell and fans.

Conservatively, the installed cost of the indirect heat rotary dryer, including motors, but exclusive of other auxiliaries, can be figured at $2800 per dryer per ton of capacity at average moisture. The average installed capacity per dryer is about 5 tons per hour.

In the handling of the wet slip direct from continuous filters, the drying cost must take into account the greater amount of fuel necessary to handle this product as compared to the cost of drying the crude unwashed kaolin. On a given size of unit capacities are also relatively lower. The success of the indirect heat rotary dryer on the slip is, however, assured from the mechanical standpoint as well as efficiency.

It is roughly estimated that a plant producing at prevailing prices of air-floated material should handle upwards of 40,000 tons annually to assure rather constant operation of a moderate sized well-designed plant and a fair measure of success. In this way dryer efficiency can be maintained at the higher levels.

The dryer factor has been dwelt upon at length because, as previously mentioned, of the importance it holds in this work.

Wet Reclamation of Tailings

Reference to that part of the flow sheet showing the wet method of recovering some of the kaolin in the tailings discharged from the air separators, will disclose the fact that there is little difference in this from the practice followed by other industries—in the production of whiting, oxides and other non-metallic minerals, as well as in the handling of concentrates in ore milling but, of course, with some variations. As the system is as yet not generally accepted by all producers and since experiments are still being carried on, it is well not to consider it other than in the light of having possibilities in this field. Recoveries thus far seem to be low on the basis of capital invested.

Mining—Overburden and Kaolin

Handling of the overburden and crude kaolin at the pits is not greatly different from many other open-pit mining operations. Power shovels and draglines are generally used on the overburden, and shovels and hand methods of stripping and loading on the kaolin. In some cases a combination of truck and dump-car haulage to crude wet kaolin bins is used. Haulage in some instances is as much as 13 miles. Partial hydraulic mining has been practiced to some

extent in the distinctly wet process plants with "blungers" and wet screens and launders to accomplish the disintegrating of clay and primary removal of waste products.

Looking to Other Possibilities

Is it not possible, now with the wet system in view, to follow the procedure of the whiting producers in giving the kaolin more than ordinary disintegrating, as a possible improvement in the texture of the product? In the whiting as well as in other industries, this is accomplished by the introduction of the conical pebble mill in the circuit.

This type of attrition mill gives a smoothing out effect, improving the slip qualities that cannot be done otherwise. Oxides, pigments, talc and other products are handled in the same way.

It is also likely that an increase in density of the product may develop during this wet rubbing action, which may materially aid in settling in the thickeners, with the resultant greater recovery of kaolin. Any detrimental effect of increase in density would be met in the subsequent air floating.

Or, take also the effect in dry grinding. One of the largest talc producers follows out somewhat the same form of flow sheet as shown herewith with a conical pebble mill for grinding, and it is known that he obtains outstanding quality of product. On the tailings in kaolin processing this same system may prove beneficial for more reasons than one.

The writer wishes to apologize to the kaolin producers, if the information contained herein may in any way appear misleading or in error. The information obtained has been made possible through personal contact with representatives of all the leading producing companies over a period of ten years and without attempting to probe into or reveal confidential data on individual operations. The views therefore expressed and information given must of necessity be of a general and approximate nature. They are presented, the writer believes, in a detailed form never before attempted, with a view of creating a lasting benefit to all concerned.

Nonmetallic Mineral Resources of Eastern Oregon

THE Department of the Interior has announced completion by the United States Geological Survey, in cooperation with the Oregon State Mining Board, of a study of the nonmetallic mineral resources of that part of Oregon east of the crest of the Cascade Range. This study is based on field work in 1930 by Ralph W. Richards and Bernard N. Moore and continued in 1931 by Mr. Moore.

It appears that the nonmetallic mineral deposits of economic interest, other than building stones and road material, are asbestos, bentonitic clays, diatomaceous earth, limestone, pumice and salines. Other nonmetallic minerals are not known to occur in eastern Oregon in sufficient quantity to be of much promise. Among the minerals conspicuously lacking are gypsum and high-silica sands.

The only known occurrence of asbestos is that of amphibole asbestos on Pine creek, Baker county, south of Baker. Here the asbestos consists of long, cross and slip fiber anthophyllite which has fibers as much as 16 in. long. Not enough prospecting has yet been done to serve as a basis for estimating the tonnage of the available asbestos or the value of the deposit, although a few tons have been mined and shipped for experimental purposes. This material appears to be suitable for some of the uses for which amphibole asbestos is needed.

Very large quantities of diatomaceous earth occur in eastern Oregon and have been studied. The deposit developed to the greatest extent is that of the Atomite Corp. on the Deschutes river near Terrebonne. Material from this deposit has been used for filtration, insulation and admixtures, for fillers and in cosmetics. Though many of the deposits are small or relatively inaccessible, two deposits were studied which under suitable conditions should become important producers of high-quality diatomaceous earth.

The diatomaceous earth of eastern Oregon is all of fresh-water origin. The impurities are largely volcanic ash with lesser amounts of clay. The higher-quality earths are white, weigh from 22 to 35 lb. to the cu. ft. and are very pure.

Limestone deposits of commercial size and quality in eastern Oregon are limited to Baker and Wallowa counties, in the northeastern part of the state. The limestone is in general recrystallized and in many places has the qualities of marble.

The deposits of limestone in the Wallowa mountains have a total thickness of about 500 ft. On Hurricane creek in the vicinity of the Matterhorn these beds have been greatly crushed and locally reach great thicknesses. The quality of the limestone is not uniform, some of it containing large amounts of pyrite as well as siliceous impurities, but in some places, particularly at the quarry of the Black Marble and Lime Co., large tonnages of very high grade limestone are available.

The limestone of Connor creek, in Baker county, is a lenticular body of light-gray crystalline limestone interbedded in the argillite series. It extends across Connor and Fox creeks and contains a very large tonnage. An analysis of a typical sample from this deposit shows it to be a remarkably pure high-calcium limestone containing 55.65% of CaO, 43.93% of CO_2 and 0.52% of MgO, with traces of SiO_2, Fe_2O_3, Na_2O, K_2O and MnO; no Al_2O_3, H_2O, TiO_2, P_2O_5, SrO, Li_2O, FeS_2 or organic matter; and SO_3 and FeO undetermined.

An area of about 4000 sq. mi. in Deschutes and Klamath counties is covered by a blanket of lump pumice comprising in places several sheets.

The Crater Lake pumice is of two distinct varieties. The older sheet is an unsorted mixture of material ranging from the finest volcanic dust to lumps of pumice more than 2 ft. in diameter. The younger sheet is formed of granular pumice, most of which is between ⅛-in. and 1-in. in diameter. The pumice in each sheet is much the same in texture and structure. It contains numerous large vesicles and some phenocrysts or mineral grains of feldspar and other minerals. It should find many uses, particularly as a lower-grade abrasive and for light-weight aggregates for concrete and stucco. Several carloads of the granular material have been shipped for use in sound-proofing stuccos.

The lump pumice from Newberry Crater is very finely vesicular, contains no phenocrysts or glassy blebs and seems capable of supplying a very high grade lump pumice comparable to that imported from Italy. The locality is about 15 miles from the railroad. So far as known, no development of it has taken place.

Rock Wool for Insulation

AS AN OUTCOME of the trend toward a greater use of insulating material in the construction of homes and offices, and in other fields, the Department of Mines, Ottawa, Canada, foresees the establishment of a rock wool manufacturing industry in Canada. Should this materialize the development of the large deposits of dolomite in the Niagara Peninsula of Ontario would follow, it is stated. Surveys conducted by the department disclosed the presence of these self-fluxing, argillaceous deposits and researches indicated their suitability as raw material for the manufacture of rock wool. At present the total requirements of the product are imported.

According to M. F. Goudge, mineral technologist of the department, rock wool is one of the most effective insulating products on the market. It is made by melting suitable natural rock to a very fluid condition in a cupola furnace using coke as fuel. The molten material issues from the furnace in a small stream and is atomized by a blast of steam, which converts it into a mass of fine, pliable, colorless, glassy fibers. These fibers constitute the rock wool of commerce. It is very similar in most respects to slag wool, but is practically free from the deleterious element sulphur, compounds of which are sometimes found in objectionable quantities in slag wool.

The use of rock wool for insulation ranges from the lowest industrial temperature up to 1000 deg. F. It is marketed for a wide variety of uses, including building insulation, linings for gas and electric stoves, and refrigerators, coverings for steam pipes, oil stills, hot water pipes, boilers and furnaces. It is also the principal ingredient of an insulating cement and of an acoustic tile.

Possibility of Utilizing Carbon Dioxide from Lime Kilns for "Ice"

Arguments Pro and Con

OFFICERS of the DryIce Corp. of America, New York City, have recently contributed articles to several scientific and industrial journals on the manufacturing and distribution economics of solid carbon dioxide—so-called (trade name) "dry ice." Among these was one published in Rock Products, March 28, 1931. Another, by C. L. Jones, was published about the same time in *Industrial and Engineering Chemistry*. In both articles the possibilities of using the waste gases of lime and cement kilns were depreciated—in the *Industrial and Engineering Chemistry* article considerably more so than the one in these columns.

W. D. Mount, Lynchburg, Va., known in the lime industry as the designer and builder of the Mount kiln (installed at Rockland, Me., and Cheshire, Mass., and elsewhere) took issue with Mr. Jones in *Industrial and Engineering Chemistry*. His letter and Mr. Jones' reply follow:

Economics of Recovering By-Product Carbon Dioxide

Editor of Industrial and Engineering Chemistry:

The article under this title by C. L. Jones, while referring specifically to the manufacture of liquid and solid carbon dioxide, nevertheless contains some very amazing statements.

To one conversant with the technology of the "ammonia soda" process for manufacturing alkali, the statement by Mr. Jones that the "manufacture of carbon dioxide from limekiln gases has been a dead issue in the United States for more than two decades" is astounding, and, in common doubtless with other plant managers and engineers who have spent the better portion of their lives in connection with the alkali industry, I wonder where Mr. Jones has been that he apparently has never heard of an industry that supplies an essential raw material to nearly 160 other industries.

Carbon dioxide is one of two raw materials entering directly into sodium carbonate, or soda ash, the basic product of the alkali industry, and from the beginning the primary source of this essential raw material has been the exit gases from lime kilns. Although it is true that lime is produced and used by the alkali manufacturer for a secondary purpose, it is also true that if he had a better and cheaper source of carbon dioxide than the exit gas from lime kilns it would not, so far as a supply of lime is concerned, be necessary to operate kilns, as lime could be purchased for all purposes required in the process. Not so, however, with carbon dioxide.

Output Is Large

The combined output of soda ash of the five large alkali plants in this country operating the "ammonia soda" process is probably not far from 3 million tons per year, which, on a basis of 95% absorption, is equivalent to over 1,300,000 tons of carbon dioxide, every pound of which originated from the calcination of limestone.

Mr. Jones makes the statement that "in most parts of the United States the manufacture of pure carbon dioxide gas could be accomplished on a large scale from lime or magnesite kiln gases for a small fraction of current retail solid carbon dioxide selling prices." This statement he qualifies by saying, "provided steady operation on a large scale, small radius of shipment, and economical selling and distribution are assumed." His qualification, however, would apply with equal force to any plant manufacturing liquid or solid carbon dioxide, and utilizing gas from any source other than lime kilns. He certainly is not clear in his statement, nor does he attempt to explain why a small radius of shipment is essential to the utilization of lime-kiln gas, and not for other gases. Furthermore, I cannot understand why economical selling and distribution are more essential for a product made from this one particular source of gas than from other sources. It is to be presumed, as a matter of good business, that money would not be wasted unnecessarily in marketing any product regardless of its source, and it is a safe assumption that the radius of distribution will vary inversely with the cost of production.

Difference of Opinions

The statement that "careful analysis of more than a score of lime-kiln proposals within the past two years, however, has failed to disclose a single case which has established any sound present justification for the manufacture of solid carbon dioxide under such conditions from such a source" is absolutely meaningless in so far as giving a true picture of the possibilities of lime-kiln exit gases, unless the character of the lime-kiln plants is considered. With the type of kiln and methods of operation characteristic of the commercial lime industry generally, the statement has a more or less sound basis in fact; on the other hand, with kiln design and operation characteristic of the ammonia soda industry, the statement will not stand analysis for a moment. The ammonia soda manufacturer operates his lime kilns primarily for carbon dioxide, which, as previously stated, is an essential raw material entering directly into his product; lime, however, is not an essential raw material, nor does it enter in any way into the finished product, soda ash. Ammonia soda kilns are designed to be operated under a rigorous chemical and physical control, unknown to the commercial lime industry. The control moreover begins in the quarry with the selection of stone of uniform chemical and physical characteristics, clean and free from dirt and broken to uniform size. The kilns are charged and drawn continuously, and, aside from constant attention to the character of stone supplied, particular care is given to ratio of fuel to stone, temperature and draft; the result is an exit gas of uniform quality running somewhat in excess of 40% carbon dioxide by volume when coke is used as a fuel. Moreover, the gas when cooled and scrubbed is odorless and free from all impurities that would contaminate the finished product.

Not a Tonnage Industry

It is a misstatement that solid carbon dioxide "has a great future," and that it seems a "logical refrigerant for many purposes," particularly in the field of economical distribution of frozen foods, fruits, etc. The statement that the solid carbon dioxide industry today is not a tonnage industry is, of course, true; moreover, it will never reach that stage on the basis of present selling prices. Radical reduction in manufacturing costs must be made, and what is equally vital, the industry must be standardized technically, utilizing the cheapest possible source of carbon dioxide, with standardized equipment.

Manufacturing costs must be reduced to a point where the solid product can be sold at a satisfactory profit on a basis comparable to water ice at $4 to $5 per ton, or say $50 to $60 per ton delivered for solid carbon dioxide.

An intensive study during the past four years of the problems involved in the utilization of the exit gas from lime kilns, designed and operated under the complete chemical

and physical control characteristic of the ammonia soda industry, and producing high-grade chemical lime as a by-product, indicates that, at a rate of 25 to 50 tons per day, solid carbon dioxide can be manufactured at less than $10 per ton, including depreciation and superintendence.

W. D. Mount.

* * * * *

Mr. Jones Replies

Editor of Industrial and Engineering Chemistry: I regret that I am not in a position to expand on the points in my paper on by-product carbon dioxide economics by citing cases, which is after all the only proper approach to reducing mere economic generalizations to sound conclusions as a basis for business judgment.

One must recognize that the logic of many of Mr. Mount's beliefs, divorced from supporting statistics, seems quite as good as my own contrary statements, likewise divorced from supporting statistics.

I know of no necessity dictating commercial utilization of 40% carbon dioxide gases, however clean and well controlled, as long as the quantity of relatively pure by-product gases, 95% and over, far exceeds what the market will absorb.

The contention that lower selling prices are essential to wide market expansion has of course an appeal to the manufacturer who knows he can manufacture carbon dioxide cheaply if he has a large ready market, but must resort to conjecture or prognosis in order to include the assumption of such a market in his plans for expansion.

Not a Dead Issue

I freely confess error in the wording of my statement that manufacture of carbon dioxide from lime-kiln gases has been a dead issue for 20 years. I should have said "the manufacture of carbon dioxide *for sale*, etc." I was not unaware of the use of lime-kiln gases in the ammonia soda process, and, in passing, would point out that substantial amounts of carbon dioxide for use in process at concentrations less than 100% are derived from lime kilns and other processes also in the manufacture of beet sugar, in recarbonation of city water supplies and in the manufacture of synthetic methanol and urea.

It can be contended, of course, in any industry that a sudden drop in selling prices will make possible a large increase in market and a substantial reduction in manufacturing costs, or these three circumstances may be linked together in any other order desired, any one being considered the cause and the others effects. It has been my brief experience that sales-minded people are inclined to consider market development the cause, low prices and manufacturing costs merely effects of improved markets. The customer is prone to consider the reduction in selling price the cause, whereas the process engineer looks upon the manufacturing method as the prime cause, the other two merely links in a chain of circumstance. I am sure neither Mr. Mount nor myself can resolve this "trilemma" in your columns.

As for the figures cited in the last two paragraphs, I should be interested to know the basis of the inference that Dry-Ice at $50 to $60 is comparable to water ice at $4 to $5 since it is still my impression that these figures cannot be called "comparable" without setting up an arbitrary basis of comparison. Incidentally, sale of solid carbon dioxide at $60 is always a *fait accompli*, and cause for no remark or surprise. Such a price, however, is profitable only when the margin is not wiped out by uneconomic practices. It is unfortunately true that some solid is being sold on which trucking costs alone exceed this figure. Under these conditions, obviously, manufacturing cost could be reduced to absolute zero by the process engineer without profit to his principals.

In regard to manufacture at less than $10 per ton, we can only state that the DryIce Corp. long since reduced costs of manufacturing solid from carbon dioxide gas to considerably less than this figure. Problems of marketing, winter season standby costs, distribution losses and assured continuity of supply loom so much larger in importance that the figure taken alone has no significance.

Dividends are not paid on cost estimates but on results.

C. L. Jones.

An Analysis of Crushing and Pulverizing Processes

A PAPER delivered by Prof. Lincoln T. Work of Columbia University before the Buffalo meeting of the American Society of Mechanical Engineers discusses crushing and pulverizing methods. While much of it is beyond the ordinary reader because it runs so far into higher mathematics, a great deal of it is valuable for the new light it throws on crushing and grinding problems.

The author stresses the importance of grindability, which is significant not only between different kinds of materials but within a group of materials, such as coal. A mill which will adequately grind bituminous coal will not produce a combustible powder when grinding anthracite. It therefore becomes necessary to evaluate grindability in quantitative terms. Hardgrove and the author of the paper have compared the grindability of samples by comparing the sieve tests before and after grinding. From their work it appears that mill capacity is very nearly proportional to grindability.

The manner of disintegration is only one factor of grindability. It may be affected also by moisture, the plastic nature of the material, and its susceptibility to heat. Increasing the moisture in coal from 6 to 12% increased the power required to grind it from 15 to 18.3 kw. hr. per ton. Drying is often effective not only in reducing moisture but in reducing plasticity. The effect of heat may be noted on materials like sulphur and asphalt, which become more plastic as they are heated. Refrigeration of the mill has been suggested for such cases.

The results show that grindability has not yet been treated quantitatively, and more study is needed, particularly in such fields as portland cement manufacture, where milling is a large proportion of the total cost.

Discussing energy requirements, the author reviews the work of Dr. Martin, Gross, Zimmerley, Haultain and many others, and gives his own experimental study. This is based on statistical methods and is altogether too mathematical to abstract. However, it shows two relations in the grinding curve, the first the formation of relatively coarse pieces by direct breaking, the second the production of excess fines either before or after this breaking. A series of tests on crushing ½- to ¾-in. gravel particles of selected shapes broken in a testing machine shows that much less fines were produced where the particle was supported at three points rather than at one or two points. From these tests it was judged that impact breaking makes less dust and also that loading in the mill is all important. A smooth flat piece in a mill that is insufficiently loaded may remain for a long time without being fractured.

The author discusses the use of air and water separating devices with grinders, saying their effect is to produce fines free of coarse grit and that this may be important in the burning of portland cement where coarse grit might introduce free lime. And it is also important in the burning of powdered coal where coarse particles may pass through the flame without burning completely. But the advantages of separators are paid for by some loss in the fineness characteristics of the finished product.

In conclusion the author says: "The principles which have been laid down here illustrate the importance of grindability. A material which is difficult to grind should be reduced in a mill having extended wearing surface, parts which can be easily replaced, and a relatively slow and positive grinding action. The higher-speed mills with corresponding less wearing surface find their application with materials offering less difficulty in grinding.

"A consideration of energy requirements has shown that there is a large wastage of power over that needed to produce reduction in size. Therein lies an opportunity to improve the present milling procedures as well as an opportunity to compare the actual mill power with basic energy."

Constitution of Coal from Franklin County, Ill.

A REPORT on the carbonizing properties and constitution of No. 6 bed coal from West Frankfort, Franklin county, Illinois, has been published by the Bureau of Mines as Technical Paper 524.

Pulverized Coal—The Significance of Its Analysis to the Consumer

By Rapier R. Coghlan

THE USERS of pulverized coal are most familiar with the type of analysis, designated "proximate analysis," in which the percentage of moisture, volatile matter, fixed carbon, ash, sulphur and heating value are determined. Under an established set of operating conditions the "proximate analysis" serves admirably for keeping check on the quality of coal as burned. However, those concerned with the efficiency of operations do not obtain all of the information desirable from the "proximate analysis." For their purposes an "ultimate analysis" is desirable, which determines the percentages of the ultimate constituents of the coal as carbon, hydrogen, nitrogen, sulphur, oxygen and ash. Both types of analysis are complimentary and should be so considered, as taken together they give a maximum of information to the operator on whom rests the responsibility of using the fuel to the best advantage.

The portland cement industry is one of the largest consumers of pulverized coal in the United States. A well operated dry process cement plant of around 5,000,000 barrels annual capacity will use upward of 300,000 tons of coal annually. At average prices and distances of haulage this will represent a cold cash outlay to the coal producers and transportation companies of over $1,000,000 annually. It is highly desirable that every dollar spent for coal be spent wisely and properly safeguarded by careful and rigid inspection. The consumer pays for coal on the basis of the railroad weights taken either at the mine or at some point in transit. It is impractical for the consumer to maintain an inspector at the mine, but some means should be provided for frequent checking of the railroad weights. All coal contains moisture as mined, and for any particular seam and locality the moisture content is quite constant. The consumer should ascertain from the Bureau of Mines what this value is for the particular coal he is buying. There will be some give and take in the moisture content of the coal "as received," depending on weather conditions during transit. The extraneous moisture can and should be determined by air drying of a sample of the coal as received. The only way in which the coal used in the kilns and other operations can be balanced against the coal purchased is through knowledge of the moisture in the coal "as received." Too often this is neglected and is the cause of many explanations at inventory time.

Vein coal has an inherent ash content over which the producer has no control. Roof and floor material, as well as interbedded shale, etc., are ash producing materials over which he can exercise control. Crushed run of mine coal is more apt to approximate the ash content of the vein coal than is slack coal. Slack coal would have practically no sale were it not for the fact that it can be used successfully in a pulverized form.

The buying of coal on a heat unit basis is not general in the cement industry, but the careful sampling and analysis of coal by the consumer can be the means of saving much more than it costs. No sampling or analysis is of much value unless properly executed. The manner in which coal is loaded at the mines renders a grab sample from a shipment of practically no value. It may represent the worst or the best coal in the shipment, and may have an adverse psychological effect on the operator who has to burn it. This may appear exaggerated, but an actual case is known where a kiln room foreman cannot burn coal from a certain district if he knows it, but burns it successfully when it is loaded in railroad cars of another line than that which would ordinarily deliver it.

The American Society for Testing Materials has developed a thorough method for the sampling of coal shipments which should be adopted by the large purchaser of coal, whether it be on a heat unit basis or not. The standard methods for analysis developed by the same society should be adhered to to the letter. Most cement plant laboratories are equipped for proper ash, sulphur, moisture and B.t.u. determinations. The determination of volatile matter and fixed carbon in these laboratories is open to question, as few of them are properly equipped with the specified furnace. This is regrettable, as the furnace is inexpensive and the results obtainable are of far more value in the proper interpretation of the coal and its successful use. Very few cement plant laboratories are equipped to make an ultimate analysis of coal.

The publications of the state and United States Bureau of Mines or Geological Surveys are full of valuable information for one interested in getting the most from the coal he is using. In lieu of ultimate analyses of ones own making, the analyses of these agencies can be safely used, representing as they do a careful and complete history of the coal of any particular seam and at various localities in the state.

Bulletin No. 56, Illinois Coal, by A. Bement, published by the Illinois Geological Survey in 1929, has furnished the data on which the remainder of this article is based. This bulletin is a most interesting non-technical discussion of Illinois coal and presents the ultimate analysis of coal in a unique and readily applied form, especially in the ease with which the correct amount of air for complete combustion can be calculated. It also makes clear how the oxygen is combined in the coal.

The ultimate analysis of Seam 2, La Salle county, Illinois, as it is ordinarily expressed, will serve as an example of the way in which such an analysis can be viewed.

CONSTITUENT	PERCENTAGE
Carbon	61.10
Hydrogen	5.88
Nitrogen	1.00
Oxygen	20.18
Sulphur	3.34
Ash	8.50
	100.00

This sample represents the coal as loaded at the mine and contained 14.87% of moisture. The hydrogen in the "moisture" amounts to 14.87 ÷ 9, or 1.65%, and the

oxygen is 14.87 — 1.65%, or 13.22%. The first analysis can now be rearranged as follows:

CONSTITUENT	PERCENTAGE
Carbon	61.10
Hydrogen (5.88 — 1.65), or	4.23
Nitrogen	1.00
Oxygen (20.18 — 13.22), or	6.96
Sulphur	3.34
Moisture	14.87
Ash	8.50
	100.00

It is known that the oxygen is combined with hydrogen as "water of composition." Making this combination discloses the true combustible elements of the coal as in this analysis:

CONSTITUENT	PERCENTAGE	
Carbon	61.10	combustible elements
Hydrogen (4.23 — 6.96/8), or	3.36	combustible elements
Sulphur	3.34	combustible elements
Nitrogen	1.00	
Water of composition (6.96 + 6.96/8)	7.83	
Moisture	14.87	
Ash	8.50	
	100.00	

The ash, moisture and sulphur-free coal is called "unit coal." For the La Salle coal it is constructed in this manner. The sum of the percentages of carbon, hydrogen, nitrogen and "water of composition" totals 73.29%. Therefore if each constituent is divided by .7329, the unit coal is found and is of this composition:

CONSTITUENT	PERCENTAGE
Carbon	83.37
Hydrogen	4.58
Nitrogen	1.36
Water of composition	10.69
	100.00

The unit coal is of value in finding the ultimate analysis of any lot of coal from this seam. Assume that a lot of this coal as fired contains 2% moisture, 4% sulphur and 12% ash. These total 18%, leaving 82% of unit coal. Therefore, multiplying the percentages of the constituents of the unit coal by .82, we are able to construct the ultimate analysis of this coal as fired.

CONSTITUENT	PERCENTAGE
Carbon	68.36
Hydrogen	3.76
Nitrogen	1.12
Water of composition	8.76
Sulphur	4.00
Moisture	2.00
Ash	12.00
	100.00

The ultimate analysis of a coal is of value in determining the correct amount of air required for complete combustion. It is seen that the analysis of the unit coal above has only two elements capable of combination with oxygen in combustion. Considering the analysis as representing 100 lb. of coal, 83.37 lb. of carbon require $\frac{83.37 \times 32}{12}$, or 222.32 lb. oxygen, while 4.58 lb. of hydrogen will require $\frac{4.58 \times 16}{2}$, or 36.64 lb. of oxygen. Therefore the total oxygen required for the unit coal is 258.96 lb. One pound of sulphur requires one pound of oxygen for its combustion. Therefore, if we know the oxygen required for 100 lb. of unit coal, the oxygen required for any analysis of coal from that seam is the oxygen required for unit coal multiplied by the percentage of unit coal present, expressed decimally, plus the oxygen required for the sulphur in the non-coal. Thus, above, the unit coal is .82 of the total. Therefore the oxygen required for this lot of coal, per 100 lb., is:

.82 × 258.96 = 212.35 lb. for unit coal
4 × 1 = 4.00 lb. for sulphur

216.35 lb. total oxygen.

And 216.35 ÷ .2305 = 938.61 lb. of dry air per 100 lb. of coal.

Having calculated the oxygen required for the unit coal, it is a simple matter to take the ash, moisture and sulphur content from the proximate analysis and calculate the air required per 100 lb. of coal as above. This is of value as it applies to variations within the range of coal ordinarily supplied on a contract. It also enables the operator to change the ratio of primary to secondary air.

The proximate analysis is an adjunct to the ultimate analysis, as it reveals in a manner the division of the various constituents of the coal. The proximate analysis of the coal we are considering is:

	As mixed	Moisture free
Moisture	14.87	.....
Volatile matter	38.36	45.06
Fixed carbon	38.27	44.96
Ash	8.50	9.98
	100.00	100.00
Sulphur	3.34	3.92
B.t.u.	10,897	12,906

From the line of reasoning in the previous paragraph, we can calculate the oxygen required for this coal on the moisture-free basis. There is 9.98 + 3.92, or 13.90% non-coal and 86.10% unit coal.

0.861 × 258.96 = 222.96 lb. oxygen for unit coal
1 × 3.92 = 3.92 lb. oxygen for sulphur

226.88 lb. oxygen required.

And 226.88 ÷ 0.2305 = 984.29 lb. of air per 100 lb.

Attention is called to the following relationship between the ultimate and proximate analyses. The same coal is used for illustration.

Total carbon by ultimate analysis	71.70%
Fixed carbon by proximate analysis	44.96%
Carbon in volatile matter	26.82%
Total volatile matter by proximate	45.06%
Carbon in volatile matter	26.82%
Other constituents of volatile matter	18.24%

The other constituents of the volatile matter are:

Water of composition	9.32%
Hydrogen	3.82%
Nitrogen	1.18%
Sulphur	3.92%
	18.24%

There can be little doubt that the sulphur of iron pyrites appears in the volatile matter of coal as fired in the rotary kiln. The degree of subdivision of pulverized coal and the low temperature at which oxidation takes place (less than 500 deg. C.) makes it a certainty. Therefore it is reasonable to group the sulphur of coal with the volatiles.

I have carefully reviewed the analyses of coal from practically all Illinois mines and

ANALYSES OF ILLINOIS COAL

County	Total carbon	Fixed carbon	Carbon in volatile matter	Water of composition	Other volatiles	B.t.u.
Washington	67.17	44.24	22.93	10.20	9.60	12,225
St. Clair	68.82	44.56	24.26	9.20	9.24	12,345
Madison	68.73	44.81	23.92	10.07	9.66	12,433
Peoria	68.87	44.89	23.98	9.77	8.23	12,432
La Salle	71.78	44.96	26.82	9.32	8.92	12,906
Logan	69.52	45.11	24.41	9.56	8.62	12,416
Fulton	68.97	45.27	23.70	9.36	8.69	12,350
Macoupin	67.94	45.53	22.41	11.15	9.62	12,386
Sangamon	68.59	45.56	23.03	9.98	9.86	12,424
Christian	68.86	46.00	22.44	10.33	9.56	12,443
Macon	68.62	46.12	22.50	10.64	8.88	12,426
Montgomery	68.36	46.41	21.95	10.08	9.83	12,347
Tazewell	70.57	46.75	23.82	9.32	8.85	12,650
Marion	69.35	46.92	22.43	8.89	9.43	12,518
Vermilion	71.05	47.57	23.48	9.87	8.08	12,770
Clinton	68.86	47.85	21.01	10.85	8.62	12,412
Bond	69.19	47.91	21.28	9.99	9.31	12,257
Perry, east	69.44	47.97	21.47	10.55	8.42	12,437
Shelby	68.95	48.21	20.74	9.62	9.33	12,469
Perry, west	69.49	49.68	19.81	11.05	7.76	12,470
White	72.81	51.53	21.28	8.78	8.61	13,031
Jefferson	73.50	52.70	20.80	10.23	6.77	13,090
Franklin	73.56	53.12	20.44	10.16	6.84	13,021
Williamson	72.84	53.40	19.44	9.32	7.79	12,959
Saline	74.59	54.34	20.25	8.08	8.34	13,287
Averages	70.00	46.06	23.94	9.85	8.76	12,586
Spread	7.42	10.10	6.38	3.07	3.09	1,062

NOTE: Seam No. 2 coal—La Salle County. Seam No. 5 coal—Fulton, Logan, Macon, Peoria, Saline, Shelby, Tazewell. Seam No. 6 coal—Bond, Christian, Clinton, Franklin, Jefferson, Macoupin, Madison, Marion, Montgomery, Perry, east and west, Sangamon, St. Clair, Vermilion, Washington, White, Williamson.

COMPARISON OF TWO COALS OF SAME ULTIMATE ANALYSIS

	La Salle County	Williamson County
Ash	9.98%	10.05%
Volatile matter	45.06%	36.55%
Fixed carbon	44.96%	53.40%
Sulphur	3.92%	2.39%
Carbon	71.78%	72.84%
Hydrogen	3.92%	3.85%
Nitrogen	1.18%	1.55%
Water of composition	9.32%	9.32%
B.t.u.	12,906	12,959
Oxygen required for sulphur	3.92 lb.	2.39 lb.
Oxygen for hydrogen	31.36 lb.	30.80 lb.
Oxygen for carbon	191.41 lb.	194.24 lb.
Oxygen required for 100 lb. of coal	226.69 lb.	227.43 lb.
Air required for 100 lb. of coal	983.47 lb.	986.68 lb.
Total air required per 100 lb. of coal	983.47 lb.	986.68 lb.
Air required for fixed carbon	520.13 lb.	617.78 lb.
Air required for carbon in volatile	463.34 lb.	368.90 lb.

districts. The grouping is not in alphabetical order by counties, but rather on fixed carbon as shown by the proximate analyses.

From the grouping it is apparent that Seam No. 5 coal is not constant in composition or characteristics. For instance, the fixed carbon varies from 0.6488 to 0.7285 of the total carbon. With Seam No. 6 coal the fixed carbon varies from 0.6474 to 0.7331 of the total carbon. This means that in changing from one source of supply to another, proper attention must be given to the division of primary and secondary air, if the best results are to be obtained.

An illustration of the combined use of the two forms of analysis will serve to clarify the reasons for different amounts of primary air with different coals. La Salle and Williamson county coals from widely separated districts and two different seams have practically the same ultimate analyses, yet one is a so-called high volatile and the other a low volatile coal. The total air for burning 100 lb. of either of these coals is practically the same, yet there is a large difference in the amount of primary air required for the two coals.

Seam No. 2 coal occupies a unique place in the list of Illinois coals. Its high heating value per pound coupled with a low ash and moisture content make it a very desirable fuel for cement production. Its sulphur content, while high for some industrial purposes, does not make it of great disadvantage in a cement kiln, providing the combustion is properly controlled and the division of primary and secondary air is correct.

From the foregoing calculation it is evident that the fixed carbon of La Salle county coal requires $\frac{100 \times 520.13}{983.47}$, or 52.88% of the total air, while Williamson county coal requires $\frac{100 \times 617.78}{986.68}$, or 62.61% of the total air for the fixed carbon. It is evident that 62.61/52.88, or 1.184 times as much air is needed for the fixed carbon of Williamson county coal as for La Salle county coal. The significance of this is that if 30% of primary air is required for the proper utilization of the La Salle coal, 30×1.184, or 35.52% of primary air will be required for the Williamson coal.

Proper Amount of Primary Air Important for Best Results

The purpose of primary air in the burning of pulverized coal is to convey the coal into the furnace and supply air at higher pressure to start the combustion of the fixed carbon. As combustion is greatly accelerated at higher temperatures, the primary air can be reduced as the temperature of the air is raised. At the same time due regard must be given to the design of the primary air system if preheated air is to be used to the greatest advantage. The amount of coal that can be burned is dependent on the weight of air that can be supplied and the manner in which it is distributed. Instances are on record where a change from one type of coal to another was attended by poor results until the primary air could be adjusted to take care of the higher fixed carbon content of the new fuel.

The purchaser of coal is buying heat units. Aside from the intrinsic heating value of the vein coal, attention must be given to varying ash and moisture content, as these two items greatly affect the heating value of the coal. Special attention should be given the heating value of the coal "as received." A 1% decrease in B.t.u. value of the coal means a loss of $10,000 on a $1,000,000 annual fuel bill. Half this amount expended in assuring proper sampling and analysis of all coal purchased would more than pay for itself.

In a subsequent article the function of gas analyses in regulating the proper combustion of fuel in a cement kiln will be given and methods shown for calculating the output of a cement kiln from such analyses, when either the amount of coal or raw mix fed into the kiln is known.

Measuring Very Fine Particles

WHILE AIR SEPARATION and settling methods of measuring fine particles give full satisfaction, especially where fractions are to be saved and analyzed, the turbidity method is favored for rapid determinations and where many samples have to be studied. It can also determine sizes which are rather below those that can readily be separated by air and fluids.

Working with the form known as the microturbidimeter is described in a recent issue of *Industrial and Engineering Chemistry* by S. D. Gehman and T. C. Morris. They worked on rubber pigments, especially carbon black and zinc oxide. The black particles ranged from 0.061 to 2.22 microns, and the zinc oxide from 0.076 to 0.57 microns. These sizes were determined by a count method used with the ultra-microscope, and much of the article is given to the technique of this determination. Suspensions of these particles of known size were used to calibrate the microturbidimeter.

All turbidimeters depend on the principle that light passing through a turbid solution is scattered and loses intensity. In the microturbidimeter there is a comparison with a direct beam of light which shows when the beam has been dimmed by the turbid solution to a certain degree. The dimming varies with the fineness of the particles and also the depth; hence if the dimming is the same with two turbid suspensions of the same depth the fineness of the particles must be the same. If there is a difference, the one that dims the filament with the lesser depth has the finer particles. And the depth of suspension required to dim the filament to extinction is therefore a measure of the fineness of the particles in suspension.

The article gives a mathematical study of the method to show that in the way the beams are compared the brightness of the filament may vary a great deal without affecting the result, even with carbon black. The effect of using color filters is shown in graphs and tables. The turbidimeter is now a standard device for measuring the finer particles of rock products, especially cement, so the article will have interest for those interested in the technique of turbidimetry.

Ardealite, a New Mineral

A LIGHT YELLOW, finely powdered mineral found associated with brushite and gypsum in the caverns of Cioclovina, Roumania, gives the following analysis: CaO 31.61, SO_3 21.25, P_2O_5 21.85, H_2O (above 110 deg.) 25.14, insoluble in HCl 0.39%. This corresponds to the formula $CaHPO_4 \cdot CaSO_4 \cdot 4H_2O$. X-ray examination shows characteristic lines distinct from those of gypsum and brushite. Conclusion: The substance is a true double. The specific gravity is 2.300. The material is too fine for optical examination.—*Chemical Abstracts.*

Book on Cement Chemistry

(Reviewed by Frank A. Martin)

THE book "Cement Chemistry in Theory and Practice," by Kühl, is a lucid narrative of the development of cement research particularly from the German viewpoint. In this connection it should be noted that this viewpoint fails to give sufficient credit to the work of some of the American investigators, especially as to the compounds possible in portland cement. The earlier methods have been superceded by what is called the synthetic-technical in conjunction with the x-ray studies. This means the experimental work on commercial raw mixes and in which the "minature process" equipment is used. This method is clearly set forth and has much to recommend it to the research worker in cement. Such methods must be used with caution as the results do not compare with the standard procedure.

The description of the theory of cement burning (Part II) can be summarized as follows: At the temperature 950 deg. C., all the CO_2 has been driven off, and simple compounds of calcium, alumina and silica have formed. These are probably the monocalcium salts. As there is no liquid present at this temperature, reactions take place between the solid phases. As the temperature is raised more lime enters into combination to form the disilicates and dialuminates. At the same time the Fe_2O_3 begins to react to form the mono and then diferrite, which on further heating to about 1250 deg. C. melts. The appearance of melt at this temperature causes shrinking (corresponding to the Nacken shrinkage) and the acceleration of the reactions in the liquid phase. On further heating more lime enters into combination forming the trisilicate. On cooling while still in the kiln the different compounds crystallize and the final product is a mixture of crystals and glass. On these facts the author throws out the great amount of work done on the phase relations, claiming that clinker is not an equilibrium product. It is also pointed out that the ternary phase relations are of no value since the effect of Fe_2O_3 is not considered. While this is true to a certain extent, further study is required of these three components with Fe_2O_3. Quaternary systems are difficult to study as they require either a solid model or mathematical analysis, but a start has been made. Magnesia and other elements usually found in portland cement are included. The ternary system lime, alumina and silica is still the basis for study and allowances can be made for the other constituents. Throughout this part examples are given showing the reasons for his deductions.

The third part is a study of the constitution of portland cement clinker. Considerable space is given to the various theories that are now in favor. The conclusions are that clinker is a mixture of alite and celite with small amounts of belite, felite and possibly other compounds. Alite is stated to be a range of mixed crystals of tricalcium silicate and Janeckeite with a composition

$$x3CaO{\cdot}SiO_2 + y8CaO{\cdot}SiO_2{\cdot}Al_2O_3$$

Janeckeite is considered to be a double compound of tricalcium silicate and (hypothetical) dicalcium aluminate. Celite being the compound rich in Fe_2O_3 has the formula $4CaO{\cdot}Al_2O_3{\cdot}Fe_2O_3$ which the author proceeds to split up into $2CaO{\cdot}Fe_2O_3$ and $2CaO{\cdot}Al_2O_3$. Therefore

Alite is tricalcium silicate and diacalcium aluminate.

Celite is dicalcium ferrite and dicalcium aluminate.

Objection can be raised to his use of the hypothetical compound $2CaO{\cdot}Al_2O_3$, and the consideration of the quaternary compound as being made up of the dicalcium ferrite and aluminate. In all studies of the ternary system line, alumina and silica dicalcium aluminate does not appear and seems to be an impossible compound, and is a carry over from early investigations when the phase relations were not well understood.

The recent retraction of Janecke of his compound $8CaO{\cdot}2SiO_2{\cdot}Al_2O_3$ will require a revision of Kühl's views on composition. Whatever the reader's opinions on this subject may be he will be interested in studying these views of Kühl.

Part IV, "The Problems of Hardening and Its Signification in Cement Research," being based on the theories propounded in the previous part, suffer the same objections. The theory of gel and crystal formation is logically deduced and is probably sound. One point of interest is the discussion that tests made on cement under the microscope where large quantities of water are used, are misleading when one tries to apply the data to cement in actual use. In the latter case small quantities of water are used. The theory of hardening is the first formation of a gel, which as time goes on changes to crystals. Photographs of specimens that have been kept for twenty years show this gradual change.

Part V is the chemistry of high strength cement. In this part Gensbaurs K1 storage is described, which consists of storing specimens 1 day in moist storage, 7 days under water and 21 days in air, followed by 28 days storage in water. The strength after the 56 days is less than that at 28 days and is attributed to a "concealed expansion." Kühl reports further work on this method and theorizes about it.

The final part is on the technical aspect of high strength cement. Various formulae have been proposed to spread the lime among the acid constituents without an excess. These have been developed from actual technologic experience. His study of them leads him to formulate a new one, in which x represents the amount of limestone to be used with 1 part of clay.

$$x = \frac{2.8SiO_2 + 1.1Al_2O_3 + 0.7Fe_2O_3 - CaO \text{ (for clay)}}{2.8SiO_2 + 1.1Al_2O_3 + 0.7Fe_2O_3 - CaO \text{ (for limestone)}}$$

He deduces this formula from the interpretation of the compound constitution of cement and finds that all cements agree quite closely to it. The formulae of Janecke, Guttman and Gille, and Kühl are compared and he finds that the latter two are very similar in the case of the high iron cements.

An excellent description of the sedimentation apparatus for the determination of subsieve sizes is given and there are several photographs showing the range of particle size below the 200-mesh sieve.

He closes with a plea for further study and concludes that we should have a correct mix, ground fine, intimately mixed and then burned at a high enough temperature. The resultant clinker should not be ground too fine but rather attempt to get a range of sizes.

The book is a reprint of a series of articles published in 1930-1931 in the British journal *Cement and Cement Manufacture*. It is in English (Concrete Publications, Ltd., London, England). The American price is $2.50 (can be had through *Concrete*, Chicago, Ill.).

Determining Free Lime in Cement

A NEW METHOD has been worked out by Jerzy Konarzewski and Waclaw Lukaszewicz for determining free lime in portland cement. A sample (1 g.) is boiled with 25 cc. of a mixture (1:1) of redistilled phenol and absolute alcohol under reflux for several hours. The liquid is then filtered off through a glass filter and the residue washed with absolute alcohol. The ethanol is next removed by distillation from the filtrate, about 100 cc. mixture H_2O is added to the residue and the amount of $Ca(OH)_2$ is determined by titration with aqueous $N/15$ HCl with methyl orange indicator. The 1:1 mixture of phenol and alcohol is used because it was found that it dissolves CaO the most rapidly. This method is well suited for investigating the process of burning the cement clinker, and for the analysis of commercial cements. Cements with more than 1% free lime are unsound.—*Chemical Abstracts.*

Solubility of Calcium Carbonate and Calcium Sulphate

TEST methods and results of investigations on the solubility of calcium carbonate and calcium sulphate in water at temperatures between 182 and 316 deg. C. are given in an article in the August, 1932, issue of *Industrial and Engineering Chemistry*. These investigations showed that the solubility of both compounds decreases with increase in temperature.

Hints and Helps for Superintendents

An Inexpensive Hoist for Service Car

By Dare Paris
Monrovia, Calif.

HERE is an inexpensive hoist easily constructed from the differential of a discarded car. The pinion gear, ring gear and one axle are used. The drum consists of a

Handles light work readily

piece of heavy pipe with a brake drum from a car welded on each end of the pipe. This is keyed to the axle. The boom is made by using the back half of the car frame. Two double blocks are used on the hoisting line. This hook up is very handy around the plant and quarry.

Getting the Most Wear from Wire Rope

WHEN a wire rope is properly installed and broken in, the wear will show on one side only, namely, that next to the drum or sheave. It is a mistake to rotate the rope in order to "distribute the wear evenly." In doing so, you create an evil worse than the one you attempt to cure—you subject the line to reverse bending. The rope will then deteriorate much more rapidly than if the line were allowed to wear down naturally on one side.

Incidentally, when a rope shows a reasonable and proper amount of wear, it can be assumed that it is safely performing its duty. On the other hand, if marks of abrasive wear do not show up, the line has probably become hardened or fatigued through excessive vibration and is likely to let go suddenly.—*Yellow Strand.*

Gets Interest in Good Plant Housekeeping

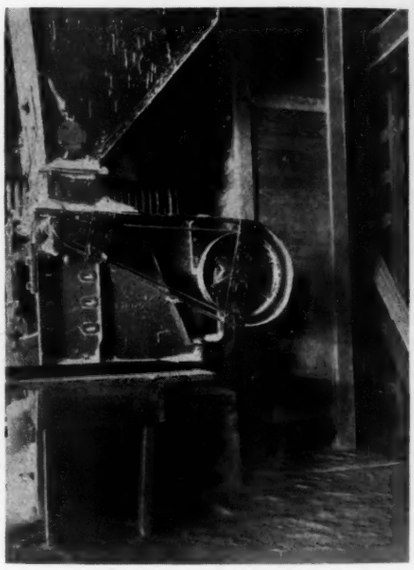
AN IDEA to stimulate cleanliness has proved successful with the Lycoming Manufacturing Co., Williamsport, Penn. The department rated "Good" has a white card with the inscription: "This Department Is Rated Good for Cleanliness and Orderliness. A Clean and Orderly Workplace Indicates a Careful and Efficient Worker." The department rated "Fair" is given a yellow card, with the same inscription except "Good" is replaced with "Fair." The same applies to the departments rated "Poor." The company found it necessary to go still further and rate the first three departments in the "Good" group "First," "Second," etc., because so many departments graduated into this division that competition had to be recognized more particularly.

Stripping Weeds from Clay Deposit

AT THE HULL, Que., plant of the Canada Cement Co., Ltd., brush and brush roots are the only foreign material in the clay deposit, and these frequently give trouble in the clay wash mill. Hence stripping consists in removing the brush and as many of the roots as possible. The operation is accomplished by a road scraper drawn by a Caterpillar tractor, as shown in the accompanying illustration.

For Sacking Machine Installation

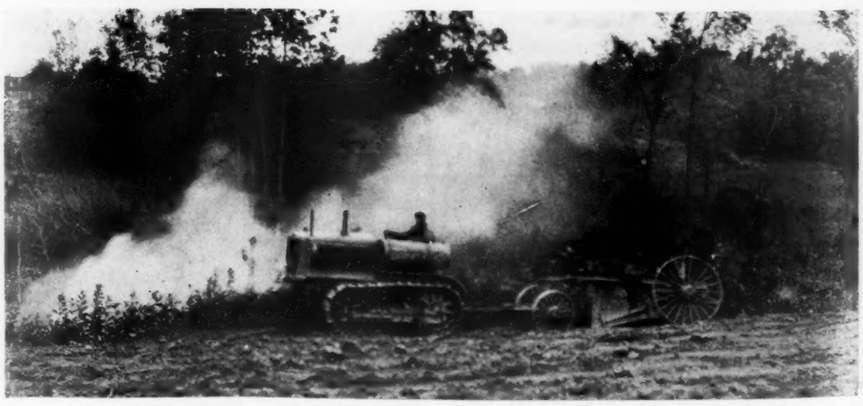
SOME of the older types of sacking machines did not have the small belt which drives the packing mechanism properly guarded; in fact, there was no guard at all. So it was necessary to install some sort of a guard for this menace at one western



Increases safety at sacking machine

plant. The illustration shows how this was done.

A second kink shown is the use of a bucket elevator for returning the "spill" to the sacking hopper. The elevator is in the rectangular wood housing at the rear of the sacking machine. This elevator picks up the "spill" from a small coned hopper under



Road scraper proves economical way to strip deposit

the sacking machine and delivers it to the steel bin above. Both of these improvements were "home made" from material salvaged from the scrap pile.

Quarry Pole Line

OLD screen sections and old boiler flues were utilized to good advantage to make poles for a quarry power line at the North Le Roy, N. Y., plant of the General

Good use of worn screen sections

Crushed Stone Co., as indicated in the accompanying illustration.

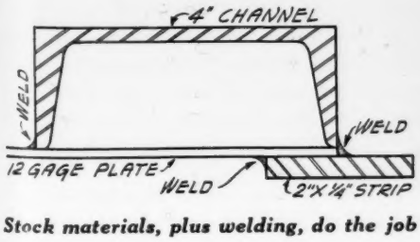
The boiler tube is simply placed in the center of the screen section, which is then filled with waste stone. Besides being of good appearance, they are easily installed and easily dismantled and no holes are required in the quarry floor.

Home-Made Steel Doors

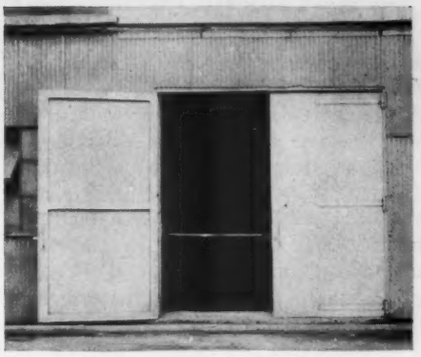
By T. N. Haffner
Superintendent, Keystone Portland Cement Co., Philadelphia, Penn.

THE DOOR illustrated and described replaces a heavy wooden door. The pair of wooden doors had rotted so badly in four years, despite being well protected with paint, that they had to be replaced. As there are a number of such doors about the plant, a cheap and durable door was wanted.

The door frame is made of standard 4-in. rolled steel channels thoroughly welded at all joints into one solid piece. The 12-gage plate was then welded to the frame, using a light bead and welding at all points where



Stock materials, plus welding, do the job



Doors are neat and serviceable

the plate touched the frame. Three small holes were drilled in the bottom side of the bottom channel to provide drainage for any water that might possibly get into the door frame. The first door warped somewhat in the welding, but this was straightened in the press. The second door was kept practically straight, without being put in the press, by welding short sections at a time at different places around the door and continuing this until all welds were complete. Spot welds were not used; the welding was continuous around the entire door.

The hardware was of steel, reclaimed from the wooden door which was replaced. All of the hardware was welded to the door and to the door jambs. Two coats of paint completed the job.

This pair of doors is equal in appearance to other doors around the plant purchased from door manufacturers, is stiffer, and I believe will last longer. These doors might easily be insulated should their location require it.

The Plant "Stool Pigeon"

AT THE SAND and gravel plant at Junction City, Nev., which will supply the aggregate for the Hoover dam, the device shown in the accompanying illustration has established a name for itself. The men at the plant call it the "stool pigeon," since they claim that everything that happens around the plant is recorded by the device.

This "stool pigeon" spans the belt conveyor that delivers the gravel from the track hopper to the primary screening unit. A second member, at right angles to the first, rides the belt and when the belt is loaded this cane-shaped arm moves up and down with the load. In the recording chamber, shown by the arrow, a continuous record is made of the happenings as regards the belt. If the belt is operating loaded or idle it records the fact, as well as that the belt is standing still.

The device was supplied by the Service Recorder Co. of Cleveland, Ohio, and is a very useful item which any plant manager might want.

Protecting Motors

IT IS sometimes necessary to place motors in exposed locations which require protection. Most of the covers which are used for such purposes make inspection difficult,

Protected, yet accessible

which is likely to result in neglect of the motor.

At the new ready mixed concrete plant of the Warner Co., Morrisville, N. J., the covering is provided with two hinged doors located so that each motor bearing may be easily inspected and oiled. These inspection doors are latched with clamps such as are used to hold automobile hoods in place.

Makes detailed record of belt loading

Industrial Modernization Program Makes Progress

A. W. ROBERTSON of Pittsburgh, Penn., chairman of the National Committee on Industrial Rehabilitation, has made public a list of manufacturing companies and other business organizations which have to date responded to the committee's program for industrial modernization launched late in August.

In all, more than $70,875,000 will be expended by the reporting companies for new machinery, equipment and plant facilities and for general remodeling, improvement and modernization in industrial plants and retail establishments.

Chairman Robertson, who is also chairman of the board of the Westinghouse Electric and Manufacturing Co., stated that the industrial rehabilitation movement will go on indefinitely. Thousands of committee workers are engaged in the promotion of the program in the twelve Federal Reserve districts, he said.

"The program of the Committee on Industrial Rehabilitation will continue indefinitely" said the chairman, "without regard to the result of the recent national election or to any other political considerations. The movement is not Republican and it is not Democratic. It is a strictly non-political effort on the part of business and industrial executives to do what they can to end the present slump in business. The program is intended primarily to reduce and finally put an end to the prostration suffered by the capital goods industries, which represent those plants engaged in the manufacture of machinery, equipment and plant facilities for other manufacturers."

Chairman Robertson added that he makes the first modernization listings public following the end of a contact tour in the course of which he, with Malcolm Muir, a member at large of the national committee and president of the McGraw-Hill Publishing Co., jointly presented the committee plan to large groups of executives in important business centers. Meetings have been held to hear the committee program outlined in Cleveland, Pittsburgh, Chicago, St. Louis, Milwaukee, Detroit, Boston, Baltimore and Philadelphia. The total attendance at these meetings is estimated at 5000.

The American Telephone and Telegraph Co., with a modernization program involving expenditure of $35,000,000, and the Standard Oil Co. of New Jersey, committed to an outlay of $20,000,000 for improvements, head the list of companies. The chairman stated that the rehabilitation proposals are being placed before the executives of every large industrial organization in the United States.

Other large modernization programs included in the list made public recently are those of the Pacific Gas and Electric Co., which will spend $5,000,000 in the next twelve months for improvements and expansion; the Great Southern Lumber Co., to spend $1,250,000 for improvements; Westinghouse Electric and Manufacturing Co., which is committed to an outlay of $1,260,000; Bogalusa Paper Co., Bogalusa, La., $1,500,000; National Steel Corp., $900,000; Allis-Chalmers Manufacturing Co., $200,000; Pittsburgh Plate Glass Co., $350,000; Continental Oil Co., $780,000, which may be increased to $1,500,000 before the end of the year.

Included also in Chairman Robertson's list are the Montana Power Co., which will expend $100,000 for a new absorption plant and refinery; the Homestake Mining Co., constructing a new cyanide metallurgical plant at Lead, South Dakota, at a cost of $250,000; Newport Rolling Mills Co., $200,000; Crosley Radio Corp., $500,000; U. S. Playing Card Co., $200,000, and Continental Can Co., $150,000.

The Pittsburgh industrial area, which is included in the committee organization for the Fourth Federal Reserve district, reports so far modernization undertakings in business and industry to cost $2,693,100. This sum will be expended by sixteen companies, these including Pittsburgh Plate Glass, National Steel and Westinghouse. The sub-committee on industrial rehabilitation for the Cincinanti industrial area, reports modernization commitments of $1,651,000 by fifteen companies to date. These companies include U. S. Playing Card, Newport Rolling Mills, Crosley Radio and Continental Can organizations.

Modernization programs reported so far for the Ninth or Minneapolis Federal Reserve district include the Montana Power and Homestake Mining operations and reach a total of $515,000 to date. Included also are expenditures of $30,000 by the Dayton Co. of Minneapolis for recently completed remodeling and modernization of its department store and of $25,000 by Boutell Brothers in Minneapolis to improve their furniture and household goods establishment. In St. Paul, Montgomery, Ward and Co. will spend $45,000 for plant improvements.

The modernization expenditures noted for the Pacific Gas and Electric Co. are included in a list of projects reported to the Committee on Industrial Rehabilitation for the Twelfth or San Francisco Federal Reserve district. In that area, rehabilitation operations include $150,000 for completion of modernization work in the plants of the Columbia Steel Co.; $200,000 for additional new facilities and industrial extensions for Gladding, McBean and Co. in its California plants; new plant in South San Francisco for the American Brake Shoe and Foundry Co., to cost $50,000 to $75,000; new plants at Oakland and San Jose, California, for the Continental Can Co., to cost $130,000; and a plant in Oakland for the El Dorado Oil Works, to cost between $300,000 and $400,000. In addition to these, the national committee reports that the Standard Oil Co. has authorization for the immediate purchase of $3,000,000 in material and equipment, which purchases normally would be spread over next year. The Paraffine Companies, Inc., have authorization for a new plant at Emeryville, Calif., to cost $52,000, and a chemical company, for the present withholding its name, has authorized resumption of its $150,000 modernization program.

"Expenditures noted in this report" said Chairman Robertson, "are for operations ranging all the way from the construction of new plants and the installation of new machinery, equipment and plant facilities to the improvement and remodeling of retail business establishments.

"These first totals only scratch the surface and do not include literally thousands of small modernization undertakings which have been reported by telephone and by mail to committees in all of the Federal Reserve districts. Working on the basis that manufacturers who have the advantage of available cash or liberal credit facilities should be approached first, the committees in the twelve Federal Reserve districts and in the industrial areas within their boundaries are visiting these manufacturers and urging them to survey their plants from the standpoint of their modernization needs. The movement is strengthened, and its opportunities for success increased, by general agreement among committee chairmen and workers to 'take their own medicine' and look into their own plants for rehabilitation opportunities. The response to this phase of the job has been most encouraging.

"Expenditures for modernization of industrial plants and of retail places of business strike at the heart of the unemployment problem, since they affect favorably the present plight of 1,620,000 unemployed workers in plants devoted to the manufacture of machinery, equipment and plant and store facilities covering a wide range of need and usefulness. The movement appeals, of course, to the self-interest of the manufacturer and the merchant alike, urging them to modernize now, at a time when equipment is low in cost and when changes may be made with a minimum of disturbance to production or operation. Such modernization places both manufacturer and merchant in a more favorable position to meet sales competition."

Mr. Robertson stressed the fact that an encouraging total of modernization and rehabilitation expenditures not due to any effort of his committee have been reported in recent weeks. He recalled the expenditures of $5,000,000 by the United States Steel Corp. and of $4,500,00 by the Remington-Rand Co.

Editorial Comment

Mr. Roosevelt's Economic Philosophy

We do not expect all the dire things to happen to business in this country as a result of the election of Franklin D. Roosevelt, that were predicted in some quarters during the heat of the presidential campaign—nor do we believe that many business men accepted and repeated these prophecies really seriously. We have never known business men to voluntarily close up their plants and abandon further opportunities to make profits merely because the man of their choice failed election to public office, and we hardly expect them to now. Anyhow, if any did have such insane inclinations there is plenty of new blood coming into business and industry which will not be handicapped by fears and apprehensions over possible political developments.

There was so much "hot air" spilled on both sides during the campaign that the real issue was constantly beclouded, although Governor Roosevelt cleared the atmosphere somewhat in his post-election statement when he said he recognized the victory of the Democratic party as a triumph for liberal thought. It was indeed a contest between the ultra-conservative "stand pattism" of the party in power and a desire to experiment on the part of all others. With economic and business conditions as they are it was inevitable that the party for experimentation, for better or for worse, should win overwhelmingly.

It is useless to lose sleep over the outcome and the dire possibilities that *may* conceivably result. The part we must all play is an active part, a willingness to experiment along with the officers in control of our government; our only anxiety should be to see that they get 100% of helpfulness and that the experiments be made along practical and intelligent lines. We must all contribute our share to the success of such experiments when they are undertaken.

Governor Roosevelt was not very specific as to what he would or could do, nor could any intelligent man expect him to be at this time. Anyhow, right now we are not so much concerned with his methods as with the philosophy that will underlie his methods and his acts. We believe this philosophy is quite clearly stated in a largely forgotten address Governor Roosevelt made last May to the graduating class of Oglethorpe University—before his nomination and to an audience of young people before whom he would most naturally be entirely frank.

First of all he demanded a "wiser and more equitable distribution of wealth" and warned that "millions in want will not stand by silently forever while things to satisfy their needs are within easy reach." He outlined no specific plan for redistribution of wealth but asked for *"bold, persistent experimentation."* He said "we need to prevent by drastic means if necessary the faults of our economic system from which we suffer. We need the courage of youth.

"We cannot allow our economic life to be controlled by that small group of men whose chief outlook upon the social welfare is tinctured by the fact that they can make huge profits from the lending of money and the marketing of securities—an outlook which deserves the adjectives 'selfish' and 'opportunist,'" he continued.

Governor Roosevelt said, "In such a system [as he had in mind] the reward for the day's work will have to be greater and the reward to capital, particularly capital which is speculative, will have to be less." He declared "our basic trouble was an insufficient distribution of buying power coupled with an oversufficient speculation in production.

"While wages rose they did not rise proportionately to the reward of capital, and at the same time the purchasing power of other great groups was permitted to shrink. We accumulated such a superabundance of capital that our great bankers were vying with each other, some of them employing questionable methods, in their efforts to lend this capital at home and abroad,

"I believe we are on the threshold of a fundamental change in our popular economic thought, that in the future we are going to think less about the producer and more about the consumer."

He touched upon the moot question of monetary value and the equally pressing problem of the settlement of debts contracted at the time of prosperity. "It is self-evident that we must either restore commodities to the level approaching their dollar value of several years ago or else we must continue the destructive process of reducing, through defaults or through deliberate writing down, obligations assumed at a higher price level."

In Governor Roosevelt's economic philosophy as sketched in the quotations given we see nothing to be alarmed about. They are probably the same thoughts that are running in the minds of all of us. We all feel that the management of our surplus earnings from 1924 to 1929 was faulty—that they might have been used to continue prosperity instead of leading us into our present mire of despondency and depression. In the interest of fair play and in the interest of our own selfish business interests, he should have all our help to correct such faults in our economic system as he may have the discernment and the courage to recognize and put his finger on.

However, in discussing faults in our economic system, it must be kept in mind, as President Hoover has constantly reiterated, that it is men who make booms and depressions and not laws or principles of economics. What we need is education and how to apply it, perhaps, as much as a new economy. Experimentation is a great teacher.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	*Dividend
Allentown P. C. 1st 6's[27]	11-15-32	No market		
Alpha P. C. com.[2]	11-14-32	8	10	25c qu. Apr. 25
Alpha P. C. pfd.[2]	11-14-32	60	.....	1.75 qu. Sept. 15
Amalgamated Phos. 6's, '36[19]	11-11-32	90	.....	
American Aggregates com.[19]	11-11-32	1	3	
American Aggregates pfd.[19]	11-11-32	5	15	1.75 qu. Jan. 1
American Aggregates 6's w.w.[19]	11-11-32	30	40	
American Aggregates 6's ex-w.[19]	11-11-32	28	38	
Amer. L. & S. 1st 7's[27]	11-15-32	50	.....	
Arundel Corp. com.	11-14-32	20 actual sale		75c qu. Oct. 1
Bessemer L. & C. Class A[4]	11-11-32	.....	2	
Bessemer L. & C. 1st 6½'s[4]	11-11-32	.....	21	
Bessemer L. & C. cert. of dep.[4]	11-11-32	.....	20	
Bloomington Limestone 6's[27]	11-15-32	No market		
Boston S. & G. new com.[37]	11-11-32	2½	5	5c qu. July 1
Boston S. & G. new 7% pfd.[37]	11-11-32	16	20	87½c qu. Oct. 1
Boston S. & G. 7's, 1934[10]	11-11-32	50	57	
California Art Tile, A[40]	11-10-32	1½	4¼	
California Art Tile, B[9]	11-11-32	.....	4	
Calaveras Cement com.[9]	11-11-32	.....	1½	
Calaveras Cement 7% pfd.[9]	11-11-32	.....	50	1.75 qu. Oct. 15
Canada Cement com.	11-14-32	4⅛	4⅝	
Canada Cement pfd.	11-14-32	26	.....	1.62½ qu. June 30
Canada Cement 5½'s[42]	11-10-32	73	76	
Canada Crushed Stone bonds[42]	11-10-32	71	.....	
Canada Crushed Stone com.[42]	11-10-32	3	.....	
Certainteed Products com.	11-14-32	1¾	2¼	
Certainteed Products pfd.	11-14-32	7	9½	1.75 qu. Jan. 1
Certainteed Products 5½'s	11-14-32	39 actual sale		
Cleveland Quarries	11-14-32	.....	30	10c qu. Dec. 1
Consol. Cement 1st 6½'s, A[44]	11-15-32	4	7	
Consol. Cement pfd.[27]	11-15-32	No market		
Consolidated Oka Sand and Gravel (Canada), 6½'s[12]	10-28-32	50	.....	
Consolidated Oka Sand and Gravel (Canada) pfd.[42]	11-10-32	.....	50	
Consol. Rock Prod. com.[35]	11-10-32	10c	25c	
Consol. Rock Prod. pfd.[35]	11-10-32	50c	1	
Consol. Rock Products units[35]	11-10-32	1	2	
Consol. S. & G. pfd. (Can.)	11-14-32	.....	50	50c qu. Nov. 15
Construction Mat. com.	11-14-32	⅜	.....	
Construction Mat. pfd.	11-14-32	1	4½	
Consumers Rock and Gravel, 1st Mfg. 6's, 1948[35]	11-10-32	36	40	
Coosa P. C. 1st 6's[23]	11-10-32	15	.....	
Coplay Cem. Mfg. pfd.[47]	11-15-32	8	10	
Coplay Cem. Mfg. 6's, 1941[47]	11-15-32	60	65	
Dewey P. C. com.[47]	11-15-32	60	65	
Dolese and Shepard	11-14-32	11	13	$1 qu. Jan. 1
Dufferin Pav. & Cr. Stone pfd.	11-14-32	.....	25	1.75 qu. Apr. 1
Dufferin Pav. & Cr. Stone com.	11-14-32	.....	4	
Edison P. C. com.[47]	11-15-32	3	4	
Edison P. C. pfd.[47]	11-15-32	6	8	
Federal P. C. 6½'s[47]	11-15-32	55	60	
Giant P. C. com.[2]	11-14-32	2	4	
Giant P. C. pfd.[2]	11-14-32	4	7	
Gyp. Lime & Alabastine, Ltd.	11-14-32	2¼	2¾	
Gyp. Lime & Alabastine 5½'s[42]	11-10-32	34	38	
Hermitage Cement com.[11]	11-12-32	2	5	
Hermitage Cement pfd.[11]	11-12-32	12	18	
Ideal Cement 5's, 1943[29]	11-12-32	86	89	
Ideal Cement com.	11-14-32	14	17	25c qu. Oct. 1
Indiana Limestone 6's	11- 4-32	11	12	
International Cem. com.	11-14-32	10⅛	10½	50c qu. Mar. 31
International Cem. bonds, 5's	11-14-32	64 actual sale		Semi-ann. int.
Kelley Island L. & T.	11-14-32	9¾	10	25c qu. Oct. 1
Ky. Cons. Stone com.[45]	11-10-32	1	2	
Ky. Cons. Stone 7% pfd.[45]	11-10-32	10	15	
Ky. Cons. Stone 1st Mtg. 6½'s[45]	11-10-32	15	18	
Ky. Cons. St. V. T. C.[45]	11-10-32	1	2	
Ky. Rock Asphalt com.	11-14-32	¾	1	
Ky. Rock Asphalt pfd.[11]	11-12-32	25	30	
Ky. Rock Asphalt 6½'s	11-14-32	59	62½	
Lawrence P. C.[2]	11-14-32	7	10	
Lawrence P. C. 5½'s, 1942[2]	11-14-32	33	.....	
Lehigh P. C. com.	11-14-32	6	8	
Lehigh P. C. pfd.	11-14-32	55	63	1.75 qu. Oct. 1
Louisville Cement[7]	11-10-32	60	80	
Lyman-Richey 1st 6's, 1935[13]	11-11-32	85	95	
Marbelite Corp. com.[35] (cement products)	11-10-32	3c	30c	
Marbelite Corp. pfd.[35]	11-10-32	50c	.....	
Marquette Cement com.[47]	11-15-32	8	10	
Marquette Cement pfd.[47]	11-15-32	50	55	1.50 qu. Oct. 1
Marquette Cem. Mfg. 1st 5's, 1936[46]	11-15-32	70	.....	
Marquette Cem. Mfg. 1st 6's, 1936[46]	11-15-32	75	.....	
Material Service Corp.	11-14-32	4	11	
McCrady-Rodgers 7% pfd.[22]	11-10-32	20	30	87½c qu. June 30
McCrady-Rodgers com.[22]	11-10-32	No market		75c qu. Jan. 26
Medusa P. C. pfd.[47]	11-15-32	40	50	1.50 qu. Apr. 1
Medusa P. C. com.[47]	11-15-32	4	5	
Monarch Cement com.[47]	11-15-32	45	50	
Michigan L. & C. com[6]	10-29-32	45	.....	
Missouri P. C.	11-12-32	6	.....	25c qu. Jan. 30
Monolith Portland Midwest[9]	11-11-32	60c	90c	
Monolith P. C. com.[9]	11-11-32	1	1¼	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	11-11-32	1¼	1½	40c s.-a. Jan. 1
Monolith P. C. units[9]	11-11-32	3½	4¼	
Monolith P. C. 1st Mtg. 6's[9]	11-11-32	35	40	
National Cem. (Can.) 1st 7's[27]	11-15-32	70	80	
National Gypsum A com.[27]	11-15-32	2	3	
National Gypsum pfd.[27]	11-15-32	27	.....	1.75 qu. Oct. 1
National Gypsum 6's[3]	11-15-32	70	.....	
National L. & S. 6½'s, 1941[19]	11-11-32	65	70	
Nazareth Cement com.[47]	11-15-32	3	5	
Nazareth Cement pfd.[47]	11-15-32	20	25	
Newaygo P. C. 1st 6½'s[27]	10-18-32	80	90	
New England Lime 6's, 1935[14]	11-12-32	No market		
N. Y. Trap Rock 1st 6's	11-14-32	65 actual sale		
N. Y. Trap Rock 7% pfd.[27]	11-15-32	.....	60	1.75 qu. Oct. 1
North Amer. Cem. 1st 6½'s	11-11-32	18½	20⅜	
North Amer. Cem. com.[27]	11-15-32	No market		
North Amer. Cem. 7% pfd.[27]	11-15-32	50c	.....	
North Shore Mat. 1st 6's[15]	11-15-32	18	20	
Northwestern States P. C.[47]	11-15-32	20	23	
Ohio River S. & G. com.	11-14-32	.....	5	
Ohio River S. & G. 1st pfd.	11-14-32	.....	50	
Ohio River S. & G. 6's[16]	11-12-32	.....	40	
Oregon P. C. com.[9]	11-11-32	8	12	
Oregon P. C. pfd.[9]	11-11-32	80	85	
Pacific Coast Aggr. com.[40]	11-10-32	.....	50c	
Pacific Coast Aggr. pfd.[40]	11-10-32	.....	1	
Pacific Coast Aggr. 6½'s, 1944[5]	11-10-32	11	12½	
Pacific Coast Aggr. 7's, 1939[5]	11-10-32	2¾	4¾	
Pacific Coast Cement 6's[5]	11-10-32	42	.....	
Pacific P. C. com.[5]	11-10-32	2½	3½	
Pacific P. C. pfd.[5]	11-10-32	30	35	1.62½ qu. Oct. 5
Pacific P. C. 6's, 1935	11- 9-32	87	94	
Pacific P. C. 6's, 1936	11- 9-32	84	94	
Peerless Cement com.[1]	11-11-32	15c	25c	
Peerless Cement pfd.[1]	11-11-32	9	12	
Penn.-Dixie Cement com.	11-14-32	1	1¼	
Penn.-Dixie Cement pfd.	11-14-32	3	7¼	
Penn.-Dixie Cement 6's	11-14-32	41¼ actual sale		
Penn. Glass Sand Corp. pfd.[27]	11-15-32	38	48	1.75 qu. Apr. 1
Penn. Glass Sand Corp. 6's[19]	11-11-32	72	77	
Petoskey P. C.	11-14-32	1⅞	2½	
Port Stockton Cem. com.[9]	11-11-32	No market		
Riverside Cement, A[9]	11-11-32	.....	5	
Riverside Cement, B[9]	11-11-32	.....	1	
Riverside Cement pfd.[9]	11-11-32	47	50	1.50 qu. Nov. 1
Sandusky Cement 6's[19]	11-11-32	75	85	
Sandusky Cement 6½'s, 1932-37[27]	11-15-32	70	80	
Santa Cruz P. C. com.	11- 9-32	31	65	$1 qu. Oct. 1
Schumacher Wallboard com.[40]	11-10-32	1	.....	
Schumacher Wallboard pfd.[40]	11-10-32	3	.....	50c qu. May 15
Signal Mt. P. C. pfd.[47]	11-15-32	5	7	
Southwestern P. C. units[47]	11-15-32	130	140	
Southwestern P. C. com.[47]	11-15-32	20	25	$1 qu. Oct. 1
Southwestern P. C. pfd.[47]	11-15-32	70	75	$2 qu. July 1
Standard Paving & Mat. (Canada) com.	11-14-32	1½	1⅞	
Standard Paving & Mat. pfd.	11-14-32	.....	34¾	50c qu. Nov. 15
Superior P. C., A[9]	11-11-32	23	25	27½c mo. Dec. 1
Superior P. C., B[9]	11-11-32	4	6	12½c Oct. 20
Trinity P. C. units[47]	11-15-32	25	28	
Trinity P. C. com.[47]	11-15-32	5	6	
Trinity P. C. pfd.[47]	11-15-32	23	25	
U. S. Gypsum com.	11-14-32	22	24	40c qu. Jan. 2
U. S. Gypsum pfd.	11-14-32	100½	.....	1.75 qu. Jan. 2
Wabash P. C.[21]	11-11-32	5	8	
Warner Co. com.[16]	11-12-32	2¼	2¾	
Warner Co. 1st 7% pfd.[16]	11-12-32	15	25	1.75 qu. Apr. 1
Warner Co. 6's, 1944, w. w.	11-11-32	30	50	
Whitehall Cem. Mfg. com.[47]	11-15-32	15	20	
Whitehall Cem. Mfg. pfd.[47]	11-15-32	35	40	
Wiscon. L. & C. 1st 6's, '33[15]	11-15-32	20	.....	
Wiscon. L. & C. 6½'s[19]	11-11-32	25	35	
Wolverine P. C. com.	11-14-32	.....	3	
Yosemite P. C., A com.[9]	11-11-32	90c	1.10	

*Latest 1932 dividend.

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Wick & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central-Republic Bk. & Tr. Co., Chicago. [16]G. M. P. Murphy & Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]Howard R. Taylor & Co., Baltimore. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher-Newton & Co., Denver. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co., Ltd., Toronto, Canada. [42]Nesbitt, Thompson & Co., Toronto. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky. [46]First Union Trust & Savings Bank, Chicago. [47]Anderson Plotz and Co., Chicago, Ill. [48]Hemphill, Noyes and Co., New York City.

Reports on Business of Gypsum, Lime and Alabastine

SPEAKING of business of the company, Mr. Haire, president of Gypsum, Lime and Alabastine, Canada, Ltd., recently said that operations had been affected by general conditions in the building industries and that sales had shown a decline of about 40% this year.

Mr. Haire stated further that the company had been very liberal with depreciation, and that no allowance on this account would be necessary this year. In the past three years reserves for this account have aggregated $709,299 in addition to reserves for depletion. He said that no price cutting had occurred in the industry, due to competition, that the company had retained a very large proportion of the available business in the products manufactured and that the effects of competition had not increased.

Pennsylvania Glass Sand Preferred Dividend Deferred

THE directors of the Pennsylvania Glass Sand Corp., Lewiston, Penn., recently voted to defer the quarterly dividend due July 1 on the $7 cumulative convertible preferred stock, no par value. The last regular quarterly payment of $1.75 per share was made on this issue April 1.

International Cement Earnings

THE International Cement Corp., New York City, reports for quarter ended September 30, 1932, net loss of $519,424 after taxes, depreciation, interest, reserve for contingencies, etc. This compares with net loss of $349,528 in preceding quarter and net income of $531,480, equal to 83c. a share on 636,171 no-par shares of common stock in September quarter of previous year.

For the nine months ended September 30, 1932, net loss was $1,278,665 after charges and taxes, comparing with net income of $1,532,107, equal to $2.41 a share on 636,171 shares in first nine months of 1931.

Consolidated income account for quarter ended September 30, 1932, compares as follows:

CONSOLIDATED INCOME ACCOUNT, INTERNATIONAL CEMENT CORP.

	1932	1931	1930	1929
Gross sales	$ 4,166,368	$ 8,938,636	$ 9,638,985	$10,377,104
Expenses, etc.	3,344,935	6,873,986	6,759,010	7,662,534
Depreciation	955,087	1,004,923	880,634	863,371
Loss	$ 133,654	*$1,059,727	*$1,999,341	*$1,851,199
Interest, taxes, contingencies, etc.	385,770	528,247	604,338	490,843
Net loss	$ 519,424	*$531,480	*$1,395,003	*$1,360,356

NINE MONTHS ENDED SEPTEMBER 30

	1932	1931	1930	1929
Gross sales	$11,274,825	$23,918,685	$25,930,394	$26,929,929
Expenses, etc.	9,425,679	18,671,513	18,794,638	20,104,104
Depreciation	2,113,293	2,307,748	2,160,579	1,932,654
Loss	$ 264,147	*$2,939,424	*$4,975,177	*$4,893,171
Interest, taxes, contingencies, etc.	1,014,518	1,407,317	1,528,411	1,365,407
Net loss	$ 1,278,665	*$1,532,107	*$3,446,766	*$3,527,764

*Profit.

Dufferin Paving and Crushed Stone, Ltd. (Canada)

THE Dufferin Paving and Crushed Stone, Ltd., Toronto, Ont., reports for the calendar years:

PROFIT AND LOSS STATEMENT OF DUFFERIN PAVING AND CRUSHED STONE, LTD.

	1931	1930	1929
Gross profits	$381,657	$706,713	$825,479
Depreciation	250,000	337,850	336,066
Depletion	45,843	52,477	66,501
Income taxes	.....	26,217	34,319
Reserve against investments	.....	60,000	.....
Net profits	$ 85,814	$230,168	$388,593
Stock dividends:			
First preferred	129,143	133,822	115,480
Second preferred	75,000	75,000	62,500
Balance	def. $118,329	$ 21,346	$210,613
Earns per share on 60,000 shares of common stock (no par)	Nil	$0.35	$3.51

CONSOLIDATED BALANCE SHEET OF THE DUFFERIN PAVING AND CRUSHED STONE, LTD.

(As of December 31)

ASSETS

	1931	1930
Cash	$ 117,748	$ 361,896
Advanced to Quebec Paving Co., Ltd.	.....	97,832
Accounts and bills receivable	111,755	210,309
Amounts withheld under contracts	127,628	47,227
Inventories	270,205	222,177
Deposits on tenders	1,921	.....
Unexpired insurance premiums	29,305	8,756
Marketable securities	32,608	.....
Cash value of life insurance	6,300	.....
Mortgages receivable	17,500	.....
Invested in and advanced to Quebec Paving Co., Ltd.	.....	157,389
Fixed assets	*3,431,909	2,956,045
Reserve quarry properties, including buildings, plant and equipment	1	1
Total	$4,146,883	$4,061,630

LIABILITIES

Accounts payable	$ 135,193	$ 102,615
Reserve for Dominion income tax	.....	26,217
Bank loan, Quebec Paving Co., Ltd.	180,000	.....
Dividend on first preferred shares	32,173	32,534
Dividend on second preferred shares	75,000	75,000
Mortgages payable	158,500	132,500
Reserve for contingencies	32,253	20,573
7% cumulative sinking fund convertible first preferred shares	1,838,500	1,858,600
6% non-cumulative convertible second preferred shares	1,250,000	1,250,000
Common stock	†60,000	60,000
Capital surplus	271,632	271,632
Profit and loss	113,630	231,959
Total	$4,146,883	$4,061,630

*After depreciation and depletion of $1,475,636.
†Represented by 60,000 shares (no par).

Limestone Products Corp.

THE income statement and balance sheet of the Limestone Products Corp. of America, Newton, N. J., for the years ended December 31, are reported as follows:

INCOME ACCOUNT, YEARS ENDED DECEMBER 31

	1931	1930
Sales	$ 298,466	Not stated
Cost of sales	117,022	.....
Expenses, interest, etc.	137,337	.....
Depreciation	36,908	.....
Depletion	4,060	.....
Operating profit	3,138	.....
Other income	2,454	.....
Net income	5,592	$ 27,641
Dividends	Not stated	17,631
Surplus	.....	$ 10,010

BALANCE SHEET AS OF DECEMBER 31

ASSETS

	1931	1930
*Mineral deposits	$1,017,500	$1,017,500
‡Buildings, machinery, etc.	558,201	544,323
§Furniture and fixtures	5,849	4,960
Real estate	5,513	5,513
Current assets:		
Cash	8,892	35,238
Accounts and notes receivable (net)	36,995	60,697
Inventories	54,307	52,171
Investments	900	640
Deferred charges	5,511	3,395
Total	$1,693,668	$1,724,436

LIABILITIES

Preferred stock	$ 391,800	$ 391,800
Common stock	†957,300	954,650
Funded debt	163,600	151,900
Current liabilities:		
Accounts payable	16,109	11,650
Notes payable	47,500	90,000
Accrued payroll	2,374	2,626
Accrued bond interest	1,536	827
Reserve for depletion	8,471	4,411
Reserve for insurance, etc.	19,473	17,227
Special reserve	42,700	45,350
Surplus	42,805	53,995
Total	$1,693,668	$1,724,436
Current assets	$ 101,095	$ 148,745
Current liabilities	67,519	105,103
Working capital	$ 33,576	$ 43,642

*At appraised value. †Represented by 17,979 no par and 1167 shares $50 par (not exchanged). ‡Less depreciation: 1931, $262,813; 1930, $237,192. §Less depreciation: 1931, $3800; 1930, $2855.

Recent Dividends Announced

Cleveland Quarries (qu.)	$0.10,	Dec. 1
Superior P. C. Cl. A (mo.)	0.27½,	Dec. 1
U. S. Gypsum com. (qu.)	0.40,	Jan. 2
U. S. Gypsum pfd. (qu.)	1.75,	Jan. 2

Concrete Paving Yardage

CONCRETE PAVEMENT yardage as awarded in the United States during October and for the period ending October 29, as reported by the Portland Cement Association, follow:

	Sq. yd. awarded during October, 1932	Total sq. yd. awarded for year to October 29, 1932
Roads	5,667,115	74,164,333
Streets	1,031,509	8,724,419
Alleys	13,461	287,527
Total	6,712,085	83,176,279

State to Abandon Cement Purchases

IT IS EXPECTED that the state of South Carolina will return to its former policy of allowing contractors to purchase their cement direct from the producers, it is reported. For the past year or more the state has pursued the policy of purchasing all cement required for its construction operations.

Foreign Abstracts and Patent Review

Steam Pressure Measurements of Portland Cement. F. Krauss, G. Joerns and W. Schriever present their third report on the examination of portland cement and its constituents, by aid of steam pressure measurements (see also *Zement,* **19,** 1930, p. 1054; and **21,** 1932, p. 31). Whereas the two previous reports offered steam pressure diagrams obtained in dehydration, this third report is a brief review and summary of the results of the experiments. The authors believe, as a result of their investigations, gel formations as well as crystal formations participate in the hardening of portland cement. The investigations are to be continued.

The hydrated fusion of a tricalcium silicate had a composition of $3.02CaO \cdot SiO_2 \cdot 2.03H_2O$. The decomposition curve of the fusion showed two "distorted" stages, the first possibly originating from silicic acid and the second from calcium hydroxide. Decomposition has undoubtedly set in, be it in hydration or in the fusion of the components; the first may be accepted as hydrolysis, and the second probably as disintegration of the tricalcium silicate into dicalcium silicate and calcium oxide. In a determination of free lime, there was 7 to 8% in the fusion prepared without water, and 15 to 17% after hydration, so that about 10% of calcium oxide was set free in hydrolysis. The fusion of the tricalcium aluminate had a composition of $3.03CaO \cdot 1Al_2O_3 \cdot 4.50H_2O$ after setting.

The authors do not believe that in the determination of the heat of reaction in setting the immediate increase in temperature is traceable alone to the process $CaO + H_2O \rightarrow Ca(OH)_2$. This probably represents the main portion of the increase in temperature, but other reactions play a part, as for example hydrolysis or hydration of the substances in the clinker.

Whereas it had been accepted that the chemical processes in the rotary kiln take place in three separated zones, namely, drying and preheating of the raw material in the first or drying zone; the dissociation of the calcium carbonate in the calcining zone; and decomposition of the alumina and silicic acid by the calcium oxide in the third or sintering zone, Schriever determined that the fixing of the free calcium oxide formed from the carbonate, with Al_2O_3, SiO_2 and Fe_2O_3, starts at a considerably lower temperature and earlier than in the third zone, and that there is no zone in the kiln in which even approximately all lime is present as free calcium oxide. Only after one-half of the calcium carbonate is dissociated in CO_2 and CaO can free calcium oxide be detected. It can therefore be assumed that the reaction sets in long before sintering.

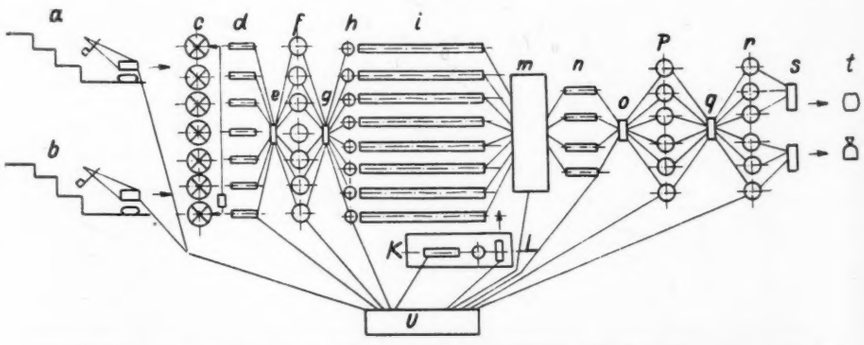
According to measurements in the rotary kiln, the calcium oxide acts vigorously on the oxides of aluminum, iron and silicon at temperatures between 600 and 700 deg. C.; while the formation of orthosilicates from the components takes place only between 1000 and 1100 deg. C., and that of aluminate only between 900 and 1000 deg. C. The action of calcium oxide started at 1100 deg. C. on the silicon dioxide, and at about 900 deg. C. on the aluminum oxide.

Determination of free lime in the fusions of the composition of monosilicate and dicalcium silicate and also of tricalcium aluminate showed that free calcium oxide could not be detected. After the hydration, that is, after mixing with 15 to 20% water, there were found only traces of free lime in the fusions of the composition of calcium silicate (9.78% water content) and of dicalcium silicate (14.11% water content); and about 4% in the tricalcium aluminate (18.65% water content). But the determination of free lime in the fusion of the composition of tricalcium silicate (12.44% water content) showed 7 to 8% of lime before hydration and 15 to 17% after hydration. It therefore appears that tricalcium silicate is responsible for free lime. A page table of test results is given by the authors.—*Zement* (1932) **21,** 7, pp. 89-93.

Flow in Portland Cement Plant. The Hemmoor Portland Cement Co. in Germany was founded in 1882. Its Hemmoor plant was the second European cement plant in which the rotary kiln process was adopted, in 1899. In the same year a Mammut pump was installed for pneumatic conveying of the slurry. The raw material consists of chalk and septarian clay. Ball and tube mills were also installed in 1899. The entire equipment was changed over to rotary kiln operation in 1909 and the grinding method improved. During the 50 years of operation, 28,000,000 bbl. of portland cement were shipped. The raw material is prepared under careful control and proportioning. The electric generating plant of the enterprise supplies electricity to many neighboring localities. The flow of the cement plant is shown.—*Tonindustrie-Zeitung* (1932) **56,** 74, pp. 926-927.

Exothermic Effect in Formation of Cement Clinker. H. E. Schwiete and H. Elsner v. Gronow state that the energy requirements in burning portland cement clinker from blast furnace slag and limestone in a rotary kiln consists essentially of two quantities; the energy conversion in the sintering of the clinker, and the work to be expended in calcining the raw meal—expelling of the carbonic acid fixed primarily in the form of calcium carbonate and only in small quantity as magnesium carbonate. Normally, the silicates which appear as essential constituents of portland cement clinker and in the formation of which heat is liberated, form with perceptible rapidity of reaction only above 907 deg. C. The exothermic effect is the heat liberated in sintering.

A solution calorimeter was used in determining the heat of solution, for finding the exothermic effect, and is described. The exothermic effect in clinker formation was determined by three different methods, with use of the solution calorimeter, and amounted respectively to 168, 169 and 170 calories per gram of clinker. The accuracy of determining the heats of solution was plus or minus 0.5%; the possible error of the exothermic



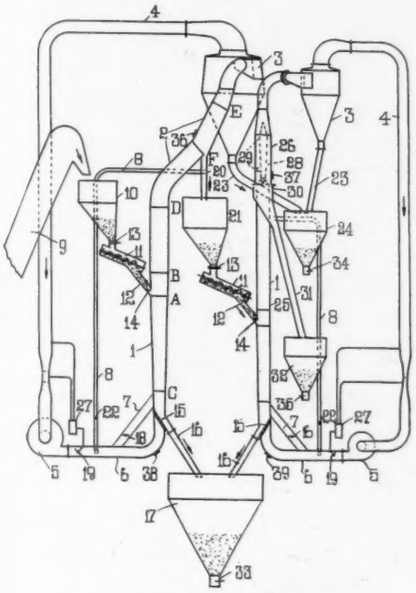
Schematic representation of the operating process of the Hemmoor cement plant, showing (a) chalk pit, (b) alumina pit, (c) five chalk and two alumina washers, (d) wet raw mills, (e) pneumatic slurry conveyors, (f) balancing and reserve bins, (g) mixing and conveying plant for raw material, (h) slurry feed, (i) rotary kilns, (k) coal pulverizer, (l) pneumatic coal dust conveyors, (m) clinker storage, (n) cement mills, (o) pneumatic cement conveyors, (p) cement reserve and mixing bins, (q) cement mixing and conveying plant, (r) storage silos for tested cement, (s) packing plant, (t) loading station, and (u) laboratory

effect amounted, therefore, to plus or minus 6 calories per gram of clinker.—*Zement* (1932) **21**, 35, pp. 497-500.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

Separation of Powdered Material. The device is especially intended for finely divided coal, but the inventor says it may be used for treating mineral pigment and other inorganic materials. Separation is accomplished in a long tube, shown as vertical,



Makes three products

although the inventor says it may be inclined. A hopper and screw feeds the material to be separated at one side. The material drops into an upward flowing stream of gas which lifts the finer particles and carries them to a cyclone. The suction fan of the cyclone discharges into the separating pipe so the apparatus is in closed circuit and no fine material can escape into the atmosphere. In the illustration the fines from the first separation are again separated so that three products are made. The inventor says that the middling product may be returned to keep the fine and coarse products as clean as possible.—*Rudolph Lessing (London, England), U. S. Patent No.* 1,850,-756.

Process for Making Mineral Fiber Articles. This is a method of making paper, blocks, etc., from asbestos fiber and raw kelp. The kelp is first treated with sodium bicarbonate and beaten, and then calcium acetate is used to precipitate insoluble compounds which are mixed with the asbestos to make the paper. The paper is claimed to have a high resisting value and an extremely high electrical insulating value.—*Arthur L. Kenedy, Assignor to Plastic, Inc., Keene, N. H., U. S. Patent No.* 1,820,538.

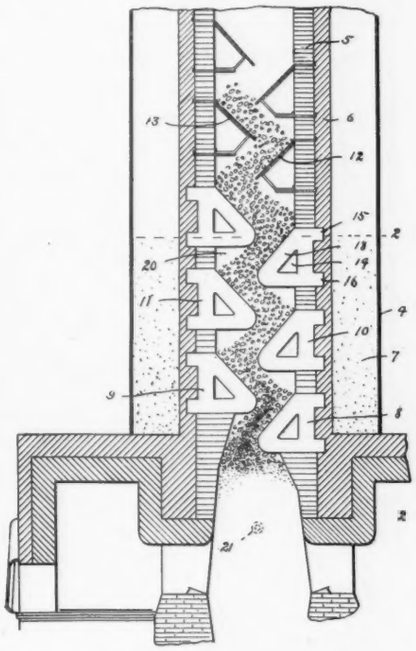
Method of Producing Hydrated Lime. When lime is hydrated in the ordinary way about half the water is lost by evaporation. With high calcium limes a stiff dough like mass is formed that is difficult to mix or plow, interfering with the operation of the hydrator.

The inventor claims to have discovered that all such difficulties are avoided by hydrating the burned lime in two stages, applying about 24% by weight of water in the preliminary stage and the remainder necessary to complete the hydration after a cooling period which should be at least two hours. The product will be improved if a longer period is given.

In the specifications the inventor claims that by his method at least 50% of the dust ejection is eliminated, the production capacity is increased, the amount of fines is increased at least 30% and several other advantages are given the product.—*C. W. Keller, assignor to American Lime and Stone Co., Bellefonte, Penn., U. S. Patent No.* 1,871,530.

Hydraulic Cement. This patent covers a mixture of ordinary portland cement and ground limestone, the limestone being added in such proportion that there are 8 parts of it for 1 part of the calcium oxide liberated from the tricalcium silicate in the cement by the addition of water.—*G. O. Case (England), U. S. Patent No.* 1,848,934.

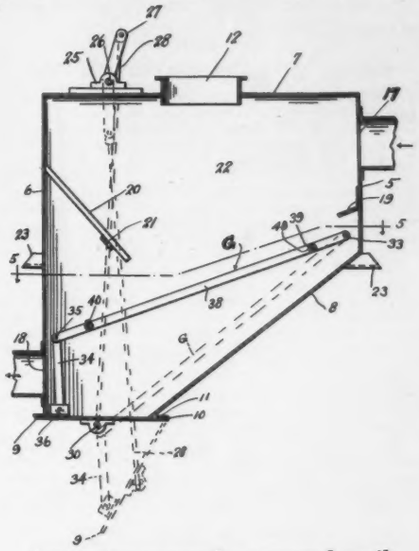
Lime Kiln. This patent covers a kiln with a restricted throat and side walls formed with precast units of a section resembling the figure 4 as shown. These are made of the same material as the best firebrick and are of a size convenient for handling. The interior triangular sectioned passages are closed at one end and open at the other in respect to the interior of the



Designed to burn spalls

kiln. The kiln is designed especially to burn spalls.—*Hugh Miscampbell, assignor to Blaw-Knox Co., Pittsburgh, Pa., U. S. Patent No.* 1,869,705.

Stone Box for Suction Pumps. The feature of this box is the ease with which large stones may be removed. The flow enters the pipe (17) and the solids fall on the grating (G). This is spaced so that the gravel and the sand goes through leaving the stones



Large stones may be removed easily

on the grate. Whenever there is an accumulation of stones on the grate the grate is lowered and a trap door at the bottom is opened as shown by the dotted lines in the illustration. The pump is shut down while this is being done. When the grate is lifted back in position the trap door is closed with the same motion.—*Clarence A. Romine, U. S. Patent No.* 1,841,209.

Structural Material. The inventors claim that their artificial material, which is called "Rostone," has the following qualities: It is close grained and takes the finest impressions in forming; it is lighter than ordinary building stones and concrete; it will dent before breaking if struck with a hard object; it is strongly resistant to acids and boiling alkali solutions; it is highly fire-resistant, has a higher compressive strength than most natural and artificial building materials; it can be cut, sawed and carved and will take a high polish; it can be colored in the process of making and unites firmly with reinforcing and aggregate.

The base of the material is shale or slate or a certain kind of clay. There must be composed wholly or in great part of aluminosilicic acid. Lime or light-burned magnesia is added with sufficient water to insure complete reaction and the mass is heated until it becomes indurated. The preferable method of indurating, according to the inventors, is curing in steam at substantially atmospheric pressure and at 212 deg. F.—*H. C. Peffer, R. L. Harrison and David E. Ross, assignors to Rostone, Inc., Lafayette, Ind., U. S. Patent No.* 1,852,672.

Traffic and Transportation

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week ending November 1:

TRUNK LINE ASSOCIATION DOCKET

30046. To establish on **pulverized glass sand or ground flint,** carloads, minimum weight 40,000 lb., from Triplett and Gore, Va., to all points to which rates are published on glass sand, carloads, from Triplett and Gore, Va., per B. & O. R. R., I. C. C. 22036, and Agent Curlett's I. C. C. A-306, the same rates as applicable on glass sand, carloads, from Triplett and Gore, Va., except to such points where rates on ground flint are higher than the rates on glass sand from Berkeley Springs district, in such instances the rates on pulverized glass sand or ground flint from Triplett-Gore, Va., will be the same difference over the glass sand rates as exist in connection with the present rates from Berkeley Springs district. Present rates, sixth class. It is further proposed to revise B. & O. R. R., I. C. C. 22029, publishing rates on ground flint, from Berkeley Springs, Great Cacapon and Hancock, W. Va., to points in Trunk Line, New England and Canadian Freight Association territories to provide for minimum weight of 40,000 lb., in lieu of present (See Note 3).

Sup. 1 to 29938. To establish rates on **common sand,** carloads (See Note 2), from Perth Amboy district to Canadian destinations on the same basis as those now applicable on molding sand per Item 6235 of Agent Curlett's Tariff I. C. C. A-306.

Sup. 1 to 30001. (a) **Crushed stone,** carloads, (b) **crushed stone, coated with oil, tar and/or asphaltum,** the oil, tar and/or asphaltum not to exceed 10% by weight of the commodity as shipped, the shipper to so certify on shipping orders and bills of lading, carloads (See Note 2), from Oriskany Falls to Lake Ariel, Penn., (a) $1.60 and (b) $1.70 per net ton.

30058. Cancel commodity rates on **sand, common or building** (other than blast, engine, fire, foundry, glass, molding or silica sand) and **gravel,** carloads (See Note 2), from Winburne, Penn.:

To points on N. Y. C. R. R., named in Items Nos. 2420 to 2470, inclusive, of Tariff No. I. C. C. N. Y. C. 15844.

To points on Penn. R. R., named in Items Nos. 9410 to 9425, inclusive, 18615 to 18630, inclusive, of Tariff No. I. C. C. N. Y. C. 16416.

To points on P. & S. R. R., named in Items Nos. 125A and 320A, of Tariff No. I. C. C. N. Y. C. 15582.

To points on B. & O. R. R., named in Items Nos. 1175 to 1230, inclusive, 4820 to 4890, inclusive, of Tariff No. I. C. C. N. Y. C. 15974.

To points on C. & I. R. R., named in Items 95 and 310, of Tariff No. I. C. C. N. Y. C. 16471.

Reason: Sand and gravel pit at Winburne, Penn., being completely worked out, and as there is no prospect for future movements, rates are obsolete.

29999. **Sand and gravel,** carloads (See Note 2), from Pinewald, Quail Run and Toms River, N. J., to Lincoln, N. J., $1.50 per net ton. Present rate, $1.73. Reason—Proposed rate is same as now in effect to New Market, N. J.

30001. (a) **Crushed stone,** carloads, and (b) **crushed stone coated with oil, tar and/or asphaltum,** carloads, the oil, tar and/or asphaltum not to exceed 10% by weight of the commodity as shipped (See Note 2), from Jamesville, Rock Cut and Syracuse, N. Y., to Lake Ariel, Penn. (a) $1.60 and (b) $1.70 per net ton. (See Note 4.)

29901. **Ground limestone,** carloads, minimum weight 50,000 lb., from Thomasville, Bricklyn, York, Hanover and Bittinger, Penn., to Fairchance, Penn., 11c per 100 lb.

30018. **Limestone, unburned, ground,** carloads, minimum weight 50,000 lb., from Buffalo stations, viz.: Carroll St., Louisiana St., Ohio St., Erie St., Black Rock and East Buffalo, to Tompkins, Nelson, Elkland, Osceola, Academy Corners and Knoxville, Penn., $1.80, and Phillips, Cowanesque, Westfield, Potter Brook, Tannery, Harrison Valley, Mills and Ulysses, Penn., $1.95 per net ton. (See Note 4.)

29925. **(A) Sand, molding, silica,** carloads; (B) **sand, building, glass, engine, ground flint, quartz or silex,** in straight or mixed carloads (See Note 2), from Hancock and Round Top, Md., to Toronto, Ont., (A) $3.70 and (B) $4.50 per net ton.

30021. **Crushed stone,** carloads (See Note 2), from White Haven, Penn., to Factoryville, Penn., $1 per net ton. Present rate, $1.10. (See Note 4.)

30024. To cancel rates on **sand and gravel,** carloads, from Contee, Laurel, Lansdowne, Md., Benning, Chillum and Terra Cotta, D. C., to all points to which rates are published from above named points in B. & O. R. R. I. C. C. 22124. Reason—Investigation develops no traffic has moved for some time nor is there prospects for further shipments, therefore rates are obsolete.

30029. **Crushed stone, coated with oil, tar or asphaltum, and crushed stone, uncoated,** carloads (See Note 2), from White Haven, Penn., to points in Pennsylvania):

(Crushed coated stone)

To	Prop.	To	Prop.
Water Gap	140	Mt. Pocono	130
Stroudsburg	140	Pocono Summit	130
Analomink	140	Saylorsburg	120
Henryville	140		

(Crushed uncoated stone)

Saylorsburg	110

Rates in cents per ton, subject to Rule 27. (See Note 4.)

30034. **Sand** (other than blast, engine, foundry, glass, molding or silica) and **gravel,** carloads (See Note 2), from Dorsey, Smith Siding, Hanover, Md., and Shepherd, D. C., to B. & O. R. R. stations, Baltimore, Laurel, Bladensburg, Waring, Mt. Airy, Martinsburg, Magnolia, West Romney, Petersburg, Winchester, Capon Road, Strasburg and various. Rates ranging from 60c to $1.60, and from Baltimore, Md., to Kernstown to Cedar Creek, inclusive, $1.20; Oranda to Capon Road and Strasburg Jct. to Strasburg, Va., inclusive, $1.30 per net ton. Reason—Proposed rates are fairly comparable with rates from Georgetown, D. C.

30037. **Sand** (other than blast, engine, foundry, molding, glass, silica, quartz or silex) and **gravel,** carloads (See Note 2), from Philadelphia, Penn., to Belfry, Penn., 80c per net ton. Present rate, 90c. Reason—Proposed rate is comparable with rate from Philadelphia, Penn., to Norristown and Phoenixville, Penn.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

CENTRAL FREIGHT ASSOCIATION DOCKET

33650. To establish on **slag, ground or pulverized,** in bulk or in barrels, bags or boxes, carloads, minimum weight 50,000 lb., from Hamilton, O., to points in C. F. A. and Trunk Line territories, 60% of sixth class rating. Present, sixth class.

33492. To cancel commodity rate of 100c per net ton on **stone,** viz., **broken, crushed, screenings** (including crushed limestone and limestone screenings), in straight or mixed carloads (in open top cars only), from Shaw Junction, Quaker Falls, Hillsville, Walford, Robinson and New Castle, Penn., to Wheeling, W. Va., via P. & L. E. R. R., Pittsburgh, West End., Penn., P. & W. V. Ry., Mingo Junction, O., and W. & L. E. Ry., published on page 5 of Sup. 4 to P. & L. E. R. R. Freight Tariff B, No. 3180, class rates as published to apply in lieu thereof.

33493. To establish on **crushed stone** and articles taking same rates, in open top cars, from Bellevue, O., to West Oberlin, O., rate of 80c per net ton plus emergency charge. Route: Via W. & L. E. Ry., Wellington, O., and L. & W.Va. Ry. Present, 70c, plus emergency charge.

33564. To establish on **limestone, agricultural,** carloads, minimum weight 60,000 lb., from Genoa, Martin, Marblehead and Danbury, O., to points in Indiana on the N. Y. C. R. R., rates as shown in Exhibit B (rates in cents per 2000 lb.):

EXHIBIT B

(To N. Y. C. R. R. points)

	From Genoa and Martin, O.		From Danbury and Marblehead, O.	
	Prop.	Pres.	Prop.	Pres.
Wauseon, O.		140	155	160
Pettisville, O.	145	150	155	160
Archbold, O.	145	150	155	160
Stryker, O.	145	150	155	160
Bryan, O.	145	150	155	160
Melbern, O.	145	160	155	160
Mina, O.	145	160	155	180
Edgerton, O.	145	160	155	180
Butler, Ind.	145	160	155	187
Waterloo, Ind.	145	160	155	187
Summit, Ind.	145	160	155	190
Pleasant Lake, Ind.	145	180	155	190
Angola, Ind.	145	180	155	190
Fremont, Ind.	145	180	155	190
Ray, Ind.	145	160	155	190
Montgomery, Mich.		145		155
Corunna, Ind.	155	160	165	187
Kendallville, Ind.	155	165	165	187
Brimfield, Ind.	155	177	165	187
Mawaka, Ind.	155	177	165	187
Ligonier, Ind.	155	177	165	187
Millersburg, Ind.	155	177	165	187
Goshen, Ind.	155	177	165	187
Middlebury, Ind.	155	200	165	200
Shipchewana, Ind.	155	190	165	200
Seyberts, Ind.	155	190	165	200
Sturgis, Mich.		155		165
Elkhart, Ind.	160	177	170	187
Morehous, Ind.	160	177	170	187
Bristol, Ind.	160	177	170	187
Vistula, Ind.	160	177	170	187
White Pigeon, Mich.		160		170

33577. To establish on **crushed stone,** carloads, from Greencastle, Ind., to Crawfordsville, Ind., rate of 65c per net ton, plus emergency charge. Present, 70c, plus emergency charge.

33581. To establish on **crushed stone,** carloads (See Note 3), from Sandusky, O., to Hereford, O., rate of 60c per net ton, plus emergency charge. Present rate, 70c, per B. & O. R. R. Tariff H-3336-D, plus emergency charge.

33582. To establish on **crushed stone,** carloads, from Monon, Ind., to Crawfordsville, Ind., rate of 75c per net ton, plus emergency charge. Present, 80c, plus emergency charge.

33596. To establish on **sand,** N. O. I. B. N., in packages or in bulk, carloads, from Sherks, Ont., to Erie, Penn., rate of 150c per net ton. Route—Via C. N., Black Rock, N. Y., N. Y. C. R. R. Present, 19½c.

33597. To establish on **gravel,** carloads, from Wolcottville, Ind., to Waterloo, Ind., rate of 70c per net ton. Route—Via P. R. R., Cedar, Ind., Indiana R. R. Present, 180c.

33598. To establish on **sand and gravel,** in open top cars, carloads, from Urbana, O., to Norwalk, O., rate of 115c per net ton, plus emergency charge. Present, 17c, plus emergency charge.

33600. To establish on **crushed stone** and articles taking same rate, in open top cars, carloads, from Bellevue, O., to Zanesville, O., rate of 110c per net ton, plus emergency charge. Present, 125c, plus emergency charge.

33628. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel,** carloads, from Attica, Ind., to Hedrick, 70c; Potomac, Armstrong, Penfield, Gifford, Dillsburg, Rantoul, 88c; Prospect, Tomlinson, Dewey, Fisher, Dickerson, Lotus, Ill., 101c per net ton. Routing—Via Wabash Ry., West Lebanon, Ind., I. C. R. R. Present, 82c to Hedrick; 102c to Potomac, Armstrong, Penfield, Gifford, Dillsburg, Rantoul; 115c to Prospect and Tomlinson, Ill.

33638. To establish on **agricultural limestone** (not ground or pulverized), in bulk, in open top cars only, carloads, from Kokomo, Ind., to Cheneyville, 83c; Paxton, 88c; Bloomington, 101c; Peoria, Ill., 114c per net ton. Route—Via N. Y. C. & St. L. R. R. direct. Present, 101c to Cheneyville; 110c to Paxton; 125c to Bloomington; 135c per net ton, Peoria, Ill.

WESTERN TRUNK LINE DOCKET

8179. Rates: **Stone, crushed,** carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Louisville, Ky., New Albany and Evansville, Ind., when originating in Georgia, to Cedar Rapids, Ia. Rates: Present—505c per net ton, based on Chicago combination. Proposed—433c.

1814-C. **Stone, crushed,** carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Ablemans, Wis., to Mexico, Mo. Present rate, 13½c per 100 lb.; proposed, 10c per 100 lb.

8170. **Stone, crushed or ground,** carloads (See Note 2), from Hannibal, Mo., to Denver, Colo. Present rate, 610c per ton; proposed, 360c.

SOUTHWESTERN FREIGHT BUREAU DOCK

25839. **Limestone, crus' or ground,** from, to and between Southeastern points. To establish carload minimum weight of 40,000 lb. in connection with present rates on limestone, crushed or ground, in bags or sacks, in straight or mixed carloads, from and to points provided with S.W.I. Tariff 162-E (W. T. L. 238-A), W. T. L. Tariff 239, also Mo. Pac. 6172-F, and similar tariffs on individual lines applicable on Missouri state traffic. Limestone is in growing demand for feeding purposes and the dealers and feeders are not in position to handle more than 40,000 lb. in one consignment. It is felt that with minimum carload weight of 40,000 lb. on this package goods the rail lines will not only handle the business, but will be saved the trouble and expense of trying to furnish small cars.

Proposed I. C. C. Decisions

25320. Cement. Oklahoma Portland Cement Co. vs. C. R. I. & G. et al. Rate, cement, Ada, Okla., to Shamrock, Tex., proposed to be found unreasonable to the extent it exceeded 20c. Reparation proposed.

25349. Molding Sand. Allen Manufacturing Co. et al. vs. L. & N. et al. Dismissal proposed. Rates, molding sand, points in Indiana and Ohio to Nashville and Franklin, Tenn., not inapplicable or unreasonable.

17517. Sand and Gravel in Georgia. On further hearing in No. 17517, rates on chert, clay, sand and gravel within the state of Georgia, and cases grouped therewith, Examiner Waters has recommended that the Commission find that the record in No. 17517 and associated proceedings does not justify the prescription of one scale of rates for application to both single-line hauls and joint-line hauls in lieu of the dual system heretofore approved and prescribed in the proceedings. He said this finding should be without prejudice to views expressed in the report proposing the according of relief by state commissions in exceptional cases of hardship from the operation of the dual system.

The Commission should further find, said the examiner, that the record did not justify the discontinuance of the authority previously granted to certain short or weak lines to charge an arbitrary of 25c a ton in addition to the standard line scales. He said the assessment of this arbitrary was optional with the short or weak line. Continuing in his recommendations, Examiner Waters said:

That the previous findings in No. 22109 that the 17517 standard line scales are reasonable rates for the interstate transportation of this traffic in southern territory should be reaffirmed.

The evidence goes to show that in exceptional instances the circumstances and conditions surrounding the intrastate transportation of this traffic within South Carolina justifies relief from the strict application of the 17517 joint line system of rates. In keeping with the thought previously expressed it is felt that the matter of working out a lawful basis of rates that will accord appropriate relief in such exceptional instances where the assessment of the 17517 joint-line arbitraries would result in real and substantial hardship should be left in the first instance to the South Carolina commission and with the hope that no further action by this Commission will become necessary.

I. C. C. Decisions

22907. Industrial Sand Cases, 1930. The Commission, in No. 22907, Illinois Silica Sand Traffic Bureau vs. A. C. & Y. et al., and a long list of cases joined with it to which the regulating body has given the generic title, No. 22907, Industrial Sand Cases, 1930, opinion No. 18084, 188 I. C. C. 99-139, has found unreasonable the rates, between points in official territory, on industrial sand and related commodities, including silica, molding, core, ground or pulverized sand, silica, clay and flint, and on gravel from Phalanx, O. It has prescribed, effective February 1, what it says are reasonable, nonprejudicial and nondiscriminatory bases of rates for the future and awarded reparation. The bases are three scales, applicable on classes of sand traffic.

Findings in certain prior reports have been modified in so far as inconsistent with the findings in this report.

The findings other than that reparation was due and that the findings in prior reports would be modified wherein they were inconsistent with those now made, follow:

We find that the interstate rates assailed in No. 17817 (Sub. No. 1) to the Chicago district are not unreasonable. We further find that the other rates assailed in these proceedings are, and for the future will be, unreasonable to the extent that they exceed or may exceed the bases set forth in Appendix H to this report.

In No. 15833, we affirm the former findings except that we find that the rates assailed from Ottawa and Utica, Ill., to Keokuk, Ia., are, and for the future will be, unduly prejudicial to Keokuk and unduly preferential of Burlington, Ia., and Quincy, Ill.

We further find that the rates assailed in No. 23912 were applicable and that the rates assailed for the past in that complaint and the other complaints embraced in this report were unreasonable in the past to the extent that they exceeded rates made on the bases set forth in Appendix H hereto.

Appendix H, showing the scales to be used and the notes indicating the application of the rates, follows:

APPENDIX H

Bases of rates prescribed herein*

Miles	Scale I Cents	Scale II Cents	Scale III Cents
5	100	80	80
10	100	100	80
20	120	100	80
30	120	100	100
45	140	120	100
50	160	120	120
65	160	140	120
70	180	140	120
75	180	140	140
90	180	160	140
100	200	160	140
110	200	160	160
140	220	180	160
180	240	200	180
190	260	200	180
200	260	220	180
220	260	220	200
240	280	220	200
260	280	240	220
280	300	240	220
300	300	260	220
340	320	260	240
360	320	280	240
380	340	280	240
400	340	280	260
420	360	300	260
440	360	300	280
460	380	300	280
500	380	320	280
520	400	320	300
540	400	340	300
560	420	340	300
580	420	340	320
620	440	360	320
640	440	380	340
680	460	380	340
740	480	400	360
760	500	400	360
800	500	420	380
825	520	420	380
850	520	440	400
900	540	440	400
925	560	440	400
950	560	460	420
1000	580	460	420
1025	600	460	420
1050	600	480	440
1100	620	480	440
1125	640	480	440
1150	640	500	460
1200	660	500	460
1225	680	500	460
1250	680	520	480
1300	700	520	480

*Rates and arbitraries are stated in cents per net ton.

Arbitraries.—The following arbitraries may be added for the haul or portion of the haul within New England: 50 mi. and under, 30c; 100 mi. and over 50, 35c; 160 mi. and over 100, 40c; 220 mi. and over 160, 45c; over 220 mi. 50c.

On traffic from origin points in New York and New Jersey to destinations in New England through New York Harbor, there may be added to the rates as above constructed an arbitrary note exceeding 70c for the movement through the harbor.

Group and differential adjustments.—Reasonable group and differential adjustments may be maintained, with certain exception limitations.

Scale I shall apply on ground or pulverized sand, silica, clay, flint, and tripoli, in carloads.

Scale II shall apply on all sand (except ground or pulverized sand) in box cars.

Scale III shall apply on high silica sand (containing not less than 95% silica), in open-top cars, molding (naturally bonded) sand, in open top cars, and core sand, in open-top cars; and on other sand, in open-top cars, from Michigan City and Willow Creek, Ind., Bridgman, Sawyer, and Muskegon, Mich., Barr, Bedford, Dundee, Geauga Lake, Massillon, Phalanx, and Warwick, Ohio, and Polk, Schollard, and Utica, Penn.

The scale of rates prescribed in the Penn. Sand and Gravel Ass'n case, 104 I. C. C. 729, shall apply on gravel, in carloads, from Phalanx, Ohio.

Distances—In computing distances for the future application of Scales I, II, III, the shortest routes over which carload traffic can be moved without transfer of lading shall be used.

Minimum weights—The carload minimum in connection with Scale I shall be 60,000 lbs. The carload minimum in connection with the other scales shall be 90% of the marked capacity of the car except that when car is loaded to full visible or cubic capacity actual weight will apply.

Emergency charges—To the rates as arrived at under the distance scales and provisions set forth above may be added the authorized emergency charges.

Claims Allocation of Road Would Diminish Cement Shipments

JOINT allocation of the Lehigh and New England railroad to the New York Central, the Baltimore and Ohio, the Pennsylvania and the Chesapeake and Ohio railroads, as provided in the four-party plan of Eastern consolidation recently approved by the Interstate Commerce Commission, was opposed by the New England road in a petition filed with that body November 6.

Asking for a reopening of the case for further consideration, the Lehigh said joint ownership of its lines would diminish the flow of anthracite and cement from origin points on that line.—*New York* (N. Y.) *Times.*

Must Prevent Misuse of Highway Funds by Other Income

General Sales Tax, in Growing Favor, May Put Brakes on Gas Tax Diversion

AS THE TIME APPROACHES for the convening of legislatures in over 40 states, the real seriousness of the situation with respect to raids on public highway funds grows more evident.

State income from various sources is generally below estimates; bond interest and certain other expenses which loom large in the budgets of most states, do not decline; demands for unemployment relief have far exceeded expectations and give no promise of early cessation. Highway income, while shrunken in the gross, offers a natural temptation to the mass of legislators.

Today, formidable groups in many legislatures favor diversion of gasoline tax money to an extent which would wreck orderly road building and add tens or hundreds of thousands of road workers to the bread lines. This situation does not indicate opposition to road building but an entire lack of other feasible plans by which the needed funds can be obtained. Legislatures are confronted with the necessity for raising money and with the fact that gasoline tax and automobile license fees continue to come in as real estate and personal property tax receipts dwindle.

This latter fact may not be accepted as proof that people pay motor fuel and vehicle taxes and avoid paying general taxes, but rather that the gasoline tax represents a type of levy particularly adapted to the present circumstances, while the contrary is true of most of the other forms of taxation. Millions of home owners drive automobiles. All of these pay the gasoline tax, while many thousands have defaulted on property tax payments.

Why Gasoline Taxes Are Still Collected

The gasoline tax is paid currently in small amounts, while the real estate or property tax is usually paid annually in a lump sum. One seems trifling—the other looms large. The vehicle owner is always paid up to date on his gasoline tax and the amount yielded by this tax is accurately known to collecting officials as frequently as collection is made from gasoline distributors. With the general taxes payment is never made until the tax period has expired, accurate estimate of the tax yield is impossible, and volume of collections uncertain. The property tax offers the hard-pressed owner no means by which he can reduce it or otherwise adapt payment to the necessities of his reduced income; the sales tax is assessed only in proportion to current purchases.

The extent to which gasoline tax funds are being used to finance general and emergency requirements of government demonstrates more than anything else the practicability of the sales tax for this purpose. The gasoline tax is a sales tax collected from gasoline users only, and therefore fairly spent only for purposes beneficial to gasoline users as a class. The general sales tax possesses all of the characteristics of the gasoline tax with which we are familiar, but spreads the load to all and produces revenue properly usable for all the regular and extraordinary expenses of government with which we are now confronted.

Any sums that could possibly be obtained

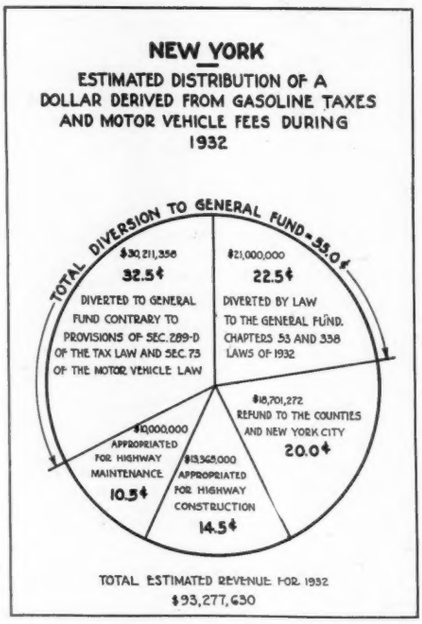

NEW YORK
ESTIMATED DISTRIBUTION OF A DOLLAR DERIVED FROM GASOLINE TAXES AND MOTOR VEHICLE FEES DURING 1932
TOTAL DIVERSION TO GENERAL FUND = 55.0¢
$30,211,356
32.5¢
DIVERTED TO GENERAL FUND CONTRARY TO PROVISIONS OF SEC. 289-D OF THE TAX LAW AND SEC. 73 OF THE MOTOR VEHICLE LAW
$21,000,000
22.5¢
DIVERTED BY LAW TO THE GENERAL FUND. CHAPTERS 53 AND 338 LAWS OF 1932
$18,701,272
REFUND TO THE COUNTIES AND NEW YORK CITY
20.0¢
$13,525,000
APPROPRIATED FOR HIGHWAY CONSTRUCTION
14.5¢
$9,000,000
APPROPRIATED FOR HIGHWAY MAINTENANCE
10.5¢
TOTAL ESTIMATED REVENUE FOR 1932
$93,277,630

Chart showing extent of New York highway fund diversion

from road funds would be entirely inadequate to meet present emergency needs, and their use would get nowhere other than to break down the present orderly program of highway development, add tremendously to the demands on charity, and deprive the public of an opportunity to take advantage of unequaled construction bargains.

The economics of the situation argue loudly for the general sales tax, and experience with it in the two states where it is now in effect supplies convincing proof that the sales levy is practical in its operation and positive in its results. A general sales tax levy of 1% or 2% is so light as to be practically unnoticeable—a cent or two on a dollar purchase—but the income can be made sufficient to carry our emergency relief load as we go, instead of bonding it, and in addition could restore badly needed funds heretofore diverted from highway purposes.

Mississippi Sets Precedent

Mississippi found the general sales tax to be a way out of confounding difficulties. The current budget, skinned rather much to the bone, called for more money than was in sight. So, after careful calculation the Emergency Revenue Act of 1932 was formulated and adopted. It calls for a 2% tax on nearly all commodities from May 1, 1932, "but being an emergency revenue measure shall expire and stand repealed on the 30th day of June, 1934."

Considerable antagonism was aroused against Mississippi's tax plan when it was proposed. Retailers held that business would be driven out of the state and that out-of-state merchants would benefit. It was pointed out that the cost of collection of a general sales tax would be prohibitive.

Now, after more than six months of service, none of the dire results predicted have taken place. Mississippi people have not increased their out-of-state purchases. The cost of collection has been low. The income has exceeded expectations by a wide margin and its early retailer enemies are no longer opposed.

Before the sales tax was adopted, Mississippi's credit wasn't good by any means. Now, with cash coming into the till every month, bankers have shown willingness to accept Mississippi paper. That is a benefit Mississippi hadn't reckoned on.

Mississippi's governor, M. S. Conner, whose leadership is bringing that state out of its financial difficulties, recently said:

"The general sales tax is the most efficient and equitable tax to which we can resort. Long ago endorsed by the greatest of the older economists, Adam Smith, this tax has more recently, in the light of a changed economic order, been approved by many economists and resorted to by many governments.

"This form of taxation is especially suitable to our state because it gives the widest possible spread of the tax load. No other form of taxation so widely distributes that tax burden as does the consumers' tax."

GET WHAT YOU PAY FOR, MR. MOTORIST

The New York State Construction Council invites you and your neighbors to join a state-wide group of tax-payers who are fighting for their rights—your rights. Here is all they demand:

1—That gas taxes and registration taxes shall not be increased;

2—That money from these taxes shall be used only for highway purposes, according to law.

To understand the situation, consider these facts. Taxes of New York State motorists were first increased $21,000,000; this made the total state tax, paid by motorists, $93,000,000, which the law says must be used for roads.* But the Legislature took more than half ($51,000,000) for other purposes.

This reduced the state highway program several hundred miles. It took employment away from many thousands of men who need work on roads—and from more thousands who need work in quarries, cement mills, machine shops and elsewhere.

Do you want proof? Subdivision 3, Section 289-D of the Gas Tax Law says that one-quarter of the tax shall be refunded to counties and New York City; the three-quarters kept by the State "shall be .... used for the construction, maintenance and repair of highways and bridges. . ."

Subdivision 4, Section 73 of the Motor Vehicle Law says that the State shall use all the money collected under that law "for construction, reconstruction and repair of highways and bridges. ...."

In 1931 the law was obeyed. But not in 1932. To see what happened, read the figures in the middle of this sheet.

The increased tax of $21,000,000, the State collection of $93,000,000, the diversion of the $51,000,000 are all matters of record in Albany.

HOW THE ROAD TAX DOLLAR IS SPLIT UP

	1931	1932
1—Added taxes this year, used for "general expenses" of State government	0.00	22½c
2—Used for "general fund," instead of on highways, contrary to the laws of 1929	0.00	32½c
3—Refund to New York City and Counties	20c	20c
4—Maintenance of existing highways	10½c	10½c
5—Construction of new highways and reconstruction of old highways	47c	14½c
Totals	77½c	$1.00

Last year out of every 77½c that you paid in road tax you got back 69½c in road values. This year each 77½c is raised to $1.00—and you get back 37c. Next year it is proposed to cut out ALL highway improvement. But you'll still pay the tax.

When is this to end?

Diversion of such taxes is unfair to motorists, constitutes class legislation, encourages and conceals extravagance in other departments of government, and is contrary to the laws of 1929.

This year, you pay $1 tax for every 25 gallons of gas you buy. In addition, you pay for license tags and tax on oil. The tax costs you about half as much as the gasoline.

By all means talk to your local candidate for the Legislature against diverting road tax money to other uses. Make sure that it does not happen again.

Demand that every candidate declare frankly and publicly how he stands on the questions of increasing road taxes and of using road taxes for other purposes. Do it before election day. Vote for candidates who oppose diversion and oppose increased motor taxes.

Only in that way will you get the road work that you pay for. At the same time you will help to give jobs to thousands of men, and increase business.

From now on it's "highway taxes for highways only." This means real jobs for the unemployed. It will help avoid the dole and the bread line.

Join the movement right now!

*WITH THE FEDERAL GAS TAX OF 1c AMOUNTING TO $15,000,000, THE TOTAL MOTORISTS' TAX IN NEW YORK STATE THIS YEAR IS $108,000,000!

NEW YORK STATE CONSTRUCTION COUNCIL
515 Taylor Building, Rochester, N. Y.

Poster used by New York State Construction Council in fighting gas tax diversion

Pennsylvania's Emergency Sales Tax

The adoption of a general sales tax in Pennsylvania followed a statewide protest against the proposed diversion of road funds to unemployment relief. Reports from newspapers and individuals indicate that the tax of 1% has been accepted in the full spirit of its intent, to provide the needed extra cash for the needy. It is declared that the tax is so small that the average purchaser is scarcely aware of its existence.

Pennsylvania's general sales tax was placed on the books purely as an emergency measure. The tax became effective September 1, 1932. At the expiration of six months, March 1, 1933, the tax ends.

But in that six months the tax will have brought in more than $12,000,000, and that sum added to other money available through state economies, the Federal Government and other sources, will bring adequate relief to Pennsylvania's unemployed.

The 1% tax applies to nearly all commodities. The only exceptions are sales made by farmers of their own produce, sales directly involving interstate commerce, and sales made to the United States Government. The tax shall be paid only once; the tax on goods sold for resale is paid by the final purchaser.

To eliminate fraud and marked-up prices, the Pennsylvania Emergency Relief Sales Act contains this wise statement of how retailers may collect the tax from consumers:

"Vendors may add to the retail price of any tangible personal property, the sale of which is subject to a tax hereunder, one per centum of the retail price, provided the retail price and the one per centum, representing the tax imposed by this act, be separately stated on price display signs, tickets and tags, and bills rendered in connection with the sale of such property."

Notes on Gasoline Tax and State Highway Funds

Philadelphia, Penn.—In a strong argument against the fallacy of diverting motor vehicle revenue to purposes other than highway construction and maintenance, the Keystone Automobile Club quoted the following from a statement by Col. Willard Chevalier in *Construction Methods:*

"To 'cut the cost of government' in this way can only stop the provisions of essential community facilities, add to the roll of unemployed, and reduce the number of consumers still able to buy goods. All this is to 'reduce the burden of taxes.' Taxes are no less burdensome when they are applied to the payment of a dole than when they are used for the employment of consumers in the creation of useful and permanent improvements of real economic value."

Dayton, Ohio—At the recommendation of the Public Roads Committee, the Board of Directors of the Dayton Chamber of Commerce adopted a resolution "vigorously opposing any further diversion of the gasoline tax funds for any purposes other than that for which the law was originally intended and passed." Copies of the resolution were sent to the governor, representatives in the legislature from Montgomery county, and others in the state who might be officially interested in the matter.

La Salle, Ill.—The county board of supervisors of La Salle county at a special session this week passed resolutions appropriating $40,000 for unemployment relief, the money to be taken from the county's share of the motor fuel tax fund.

Kearney, Neb.—The Nebraska Good Roads Association held its annual meeting in Kearney recently, attended by approximately 75 delegates representing various parts of the state. To guide activities of the organization for the next year the following program was adopted:

1. Retention of the 4c. gasoline tax and license fees as they now stand.
2. We will resist all attempts to divert funds received from the gasoline tax and license fees for purposes other than the construction of and maintenance of highways, in order to insure having funds available to give the greatest possible relief to the unemployed.
3. Considering the safety of life and property of the utmost importance, we favor the adoption of traffic regulations and control in keeping with the present-day needs.
4. We favor the removing of the highway program from all political invasion, and believe this can be accomplished only by the establishment of a bipartisan, non-salaried commission.
5. To protect the funds available from the gasoline tax we recommend that adequate laws be enacted to secure their collection.

Springfield, Ill.—Preliminary survey of counties that have used their motor fuel

tax money for construction of concrete pavements indicates that there will be little, if any, of this money available for unemployment relief purposes in these counties under the terms of House Bill 30, just passed by the legislature, which provides for the diversion of the counties' portion of this fund until July 11, 1933. Many counties, it has been found, not only have spent all available funds, but have anticipated their revenues beyond July 11 next year, in the form of awarded contracts. These obligations must be met before any money will be available for relief purposes in these counties.

Dallas, Tex.—A meeting attended by 80 prominent citizens, representing all sections of the state, to formally protest further gasoline tax diversion with its subsequent interruption of the present state highway program, was held at the Adolphus hotel Friday of last week. This preliminary meeting is the nucleus of a state-wide organization to combat, by intelligent legislation, proposals to take additional funds from the present tax to finance state expenses other than highways. The organization will be entirely non-political and a temporary committee, empowered to immediately form a permanent body, was appointed with the following members:

Judge W. O. Huggins, Houston, chairman; W. B. Marsh, Dallas; J. F. Barnett, Palacios; Herman Brown, Austin; Paul D. Thomas, El Paso; A. B. Davis, Lubbock; John Singleton, Waxahachie; H. C. Meyer, Rockdale, and J. S. Bridwell, Wichita Falls. T. B. Warden, of Dallas, was appointed temporary secretary.

Montgomery, Ala.—The Senate passed several bills of interest last week. One of importance will add another 1c. to the present 5c. gasoline tax, the increase to go to the Highway Department. The same bill passed the House a few days previous. Governor Miller is expected to sign promptly. On October 5 Governor Miller signed the Tucker bill, providing more adequate protection against gasoline tax evasion.

Cincinnati, Ohio—Further diversion of funds from the gasoline tax and license fees was opposed at a meeting of road contractors, material dealers and equipment distributors last week at the headquarters of Allied Construction Industries. R. E. Van Camp, chairman of the Hamilton County Committee of the Ohio Good Roads Federation, which is organizing to fight gas tax diversion, presided at the meeting and introduced L. A. Boulay, Columbus, former State Highway Director, the principal speaker.

Stressing the fact that diversion results in increasing unemployment, Mr. Boulay said: "You can't help unemployment by creating more unemployment, and diversion does just that. You can't eat at the vitals of industry by diversion and hope to bring industry back—you are only pushing them further into the mire."

Mr. Boulay stated that highway and street expenditures in Ohio had decreased about one-half since 1929.

Cleveland, Ohio—Mayor Ray T. Miller recently estimated that his city had lost $2,000,000 in normal revenues through diversion of gasoline tax income.

Denver, Colo.—At the general election November 8, voters of the state decisively declined to approve the amendment advocated by petroleum interests to decrease the present 4c. motor fuel tax to 2c. per gal. This action is generally accepted as evidence that a large majority of Colorado citizens favor continuance of the highway program.

Spokane, Wash.—Registering over 600 delegates, the 33rd annual meeting of the Washington State Good Roads Association was held in Spokane a few weeks ago. Important resolutions passed were as follows:

1. Opposing any diversion of motor vehicle funds of the state of Washington to purposes other than road building and road maintenance.

2. Authorizing the construction and maintenance of state highways regardless of city boundaries, by the State Highway Department.

3. Passing through the next session of the state legislature 51 proposed additions to the state highway system. This resolution does not carry any recommendation to the legislature.

4. Recommending to the state legislature that a reasonable portion of the lateral highway funds be used for maintenance on county roads under state supervision.

Chicago, Ill.—A state-wide referendum carried at the election November 8 provides for retiring $20,000,000 worth of tax anticipation warrants with the share of the state gasoline tax allotted to counties. The warrants were issued to pay for $18,750,000 worth of emergency relief provided last winter. The cost of the bond issue, with interest, will take over $31,000,000 during the next 20 years from funds otherwise available for highway purposes.

Rochester, N. Y.—The New York State Construction Council has sent a questionnaire to every candidate for senator and assemblyman asking for expressions on an amendment to the state constitution that would require that all revenues collected from motorists and gasoline taxes be applied exclusively to highway work. One-third of the state gasoline tax income is now diverted.

Richmond, Calif.—The city council has adopted a resolution opposing the diversion of state gasoline tax revenues to the general fund.

Washington, D. C.—The Federal Oil Conservation Board declares in its fifth report that "a properly written uniform gasoline tax law, thoroughly enforced, will do much to abate present conditions which are contrary to the best interests of the industry, the public and the state, and which in some areas are becoming almost intolerable." Such a law, to be workable and successful, it believes, has these requirements:

1. The rate should not be unduly high.
2. The incidence of the tax should be uniform.
3. The definition of material subject to the tax should be broad.
4. Funds yielded by the tax should not be diverted to uses other than for the benefit of motor vehicles.
5. The law should require that money collected in payment of the tax shall be paid to the state in a reasonably short time.

Youngstown, Ohio—The Griswold-Eshleman Co., of Cleveland, in a recent questionnaire presented to several thousand motorists and taxpayers throughout the state of Ohio by students from universities located in that state found that 82.2% of those interviewed preferred that the entire gasoline tax fund be used for maintaining and extending highways, 14.3% had no objection to diverting it to other uses, and 3.2% expressed no opinion.

Detroit, Mich.—Col. Sidney D. Waldon, chairman of the Taxation Committee of the American Automobile Association, recently said:

"The Federal Oil Conservation Board recognizes the evils that have resulted from the pyramiding of the gasoline tax from year to year and wisely urges that the rate of tax, which is now as high as 9c. a gallon in one state, be scaled down. It is generally recognized that a uniform rate for the tax throughout the entire country is not feasible because of different conditions existing as to highway obligations. On the other hand, it has become patent that the exorbitant rates enacted in some states are proving uneconomical from the standpoint of revenue and at the same time are inviting lawlessness because of the premium that the high rates put on evasion."

Seattle, Wash.—The Board of Trustees of the Seattle Chamber of Commerce unanimously approved the following resolution presented several weeks ago by the State Development Committee:

"Resolved, That the Board of Trustees of the Seattle Chamber of Commerce oppose the diversion of motor vehicle funds of the state of Washington to purposes other than road building and road maintenance."

Describes Cement-Bound Macadam Road

TO OBTAIN lower cost roads in Germany attempts are being made to replace concrete roads by other methods of construction, Otto Graf, professor, Technische Hochschule, states in a recent article in *Engineering News-Record*. To do this the cement-bound macadam road has lately received special consideration.

This road is placed by rolling together coarse stone aggregate and cement mortar so that the voids are filled with cement mortar. This requires a cement that does not set until the rolling is completed, which sometimes requires several hours, where the road is built in several layers. To produce a cement with delayed initial hardening a method of blending cement and bitumen has been developed which, it is claimed, not only satisfactorily retards the set of the cement but also retards volume change with varying temperature sufficiently that expansion joints are not required with this type of road.

A negligible reduction of strength is also claimed to result from the introduction of bitumen in cement. In a test in which 502,800 tons were transported over a test section the bending strength of test specimens which broke in the center with 10 in. distance of support under a single load was 540 lb. per sq. in. The compressive strength was between 2850 and 4480 lb. per sq. in.

In addition to its use as a road material the new binder may prove of value in other fields.

Fuller's Earth in 1931

A COMPLETE statistical report on fuller's earth, its production, physical properties and uses, are given in a bulletin of the Bureau of Mines.

Warner Company Celebrates Winning of Sand and Gravel Safety Trophy

Van Sciver Plant Establishes All-Time Record

IN THE COMMUNITY HALL at Morrisville, Penn., on the evening of Friday, October 21, Calvin Lenderman, superintendent of Warner Co.'s Van Sciver plant, received, on behalf of his workmen, a bronze plaque in recognition of the fact that his plant had won the National Sand and Gravel Safety Contest for 1931. This plant worked over 155,000 man-hours in 1931 without a lost-time accident. The plaque, which is donated each year by ROCK PRODUCTS, was presented by V. P. Ahearn, secretary of the National Sand and Gravel Association, Washington, D. C.

In the course of his remarks Mr. Ahearn said that the Van Sciver plant had worked more man-hours without a lost-time accident than any company since the beginning of the National Sand and Gravel contest.

About 70 employes of the Van Sciver plant were present at the celebration and short addresses were made by Charles Warner, Jr., secretary of the Warner Co., by Alexander Foster, Jr., vice-president, and by Franklin K. Wills, general superintendent of the sand and gravel plants.

The Warner Co. had five entries in the 1931 contest, three of which had no lost-time accidents. The other two entries had one accident each.

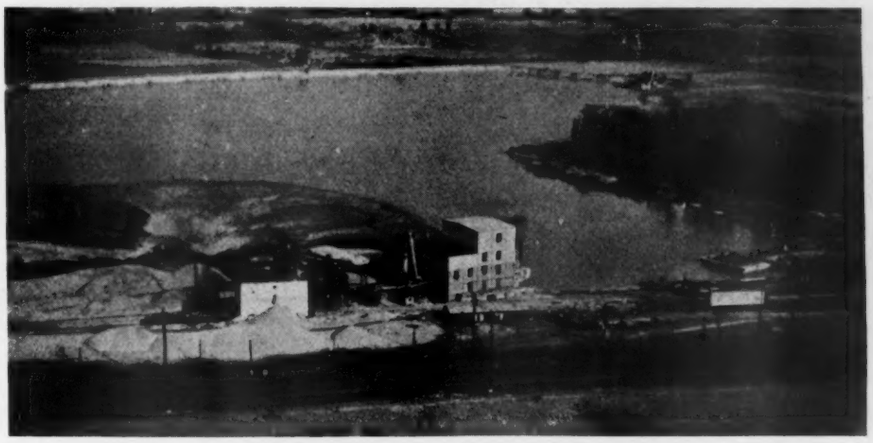
How Accident Prevention Is Achieved by Warner Co.

In a paper read before the Quarry Section meeting of the National Safety Congress, recently held in Washington, D. C., Ralph Dinsmore, personnel manager of the Warner Co., described some of the methods by which his company had achieved this enviable record. Extracts from his address follow:

> ***Editor's Note***
>
> ***THE OTHER WINNER of the National Sand and Gravel Safety Contest was the Eagle Lake plant of the Texas Construction Material Co., Houston, Tex. The story of its award will appear in a later issue.***

"For some years we have pursued the policy of safeguarding danger points around our plants, although in the sand and gravel division this work has been retarded by continual plant changes and additions. However, we are blessed with an engineering department which is safety-minded, and the safety factor has entered into the design of all new work, and has been taken into consideration in making repairs and changes. Also, when accidents have occurred, studies have been made to devise safeguards which would prevent their repetition.

"Because of this our plants are fairly well guarded. They are not perfect because we are still installing safeguards, and our safety



Van Sciver plant of Warner Co. with dredge "Viking" beyond at right

Group of employes of the Van Sciver plant of the Warner Co.

committees, on their inspection trips, still find conditions to be corrected; but it is probably true that our plants *are* safeguarded to a greater extent than is customary in the sand and gravel industry.

"The result has been a decrease in accidents and in *the severity* of accidents. But it has not eliminated them. This can scarcely be expected, because, after all, it is possible for the careless man to be injured in the best guarded plant. This safeguarding has, however, been an evidence of the company's willingness to do its part towards the elimination of accidents.

"The first step was to get accident data and to tabulate it so that we could determine where accidents were happening. As was to be expected, we found that some plants and some departments were very much worse offenders than others. It has been said often that 'safety starts at the top' and 'the foreman is the key-man in safety' and our observations seem to bear this out. After making due allowance for more hazardous work, we found almost, without exception, that the departments having the best safety records were those under foremen who were really interested in seeing that their men were not injured. We further found that in most cases those foremen who previously had not evidenced an interest in accident prevention later did so under proper stimulation.

"The second step in our safety program was the organization of safety committees at various points. The operation of these committees is not the same at all plants, but usually they make periodic inspections and submit written reports of their recommendations to the plant superintendent. They also investigate accidents and make recommendations of changes in methods or machinery which might prevent a recurrence. These committees are composed mainly of foremen.

"As a means of stimulating interest, about 18 months ago we began the publication of a monthly foremen's bulletin. This was the third step in our safety program. The purpose of this bulletin is threefold:

"First—To call attention to those foremen who are having accidents.

"Second—To engender a spirit of competition.

"Third—To impress upon the foremen their responsibility for personal injuries.

"In this bulletin all lost-time injuries are classified by plants and divisions, and also by foremen; i.e., each foreman is listed and opposite his name is placed the number of accidents occurring in his department, together with days lost-time during the preceding month and cumulative for the year. This list is arranged according to the number of accidents, the man with the best record being at the top and the worst at the bottom. In the July bulletin and at the end of the year we show the acual amount of compensation paid and medical and hospital costs charged to each foreman, so that each of them is made aware of the cost of personal injuries in his department.

"This foremen's bulletin also has several pages of reading matter devoted to safety, discussions of company policies and general information of interest. The bulletin has been very well received. We find that most of the foremen are jealous of their records and are quick to resent an error in the accident figures.

"In addition to the foremen, this bulletin is sent to executives and superintendents so that each division head knows exactly which foreman is having accidents and what they are costing.

"From the foregoing it is evident that our theory has been to work almost exclusively through the foreman; we hold him responsible for accidents in his department.

"We have not gone in for mass meetings with brass bands and outside speakers. It is not intended to condemn such methods. It may be that had we done so we would have had a better record; but our idea is that mass meetings, in order to interest every one, must of necessity be general in character, whereas safety problems are specific. For instance, if our records indicate that goggles should be worn during a certain operation, we find that a note written to the superintendent and by him passed on to the foreman results in goggles being worn. We believe that safety is an integral part of production and treat it as such.

"Gradually we have built up a spirit of competition among our foremen, and through them among the men. It is a peculiar fact, but nevertheless true, that men will do in a spirit of competition that which they will not do to save themselves pain and injury.

"In August of 1930 at one plant we started a competition among the foremen, offering as a prize a three-day trip to Philadelphia with all expenses paid to the foreman making the best safety record during the last four months of the year. Twelve foremen and over 200 men were involved. As the days went by without accident enthusiasm mounted higher and higher. When the competition finally closed on December 21 there had not been a single day lost during the four months because of a personal injury and, as all the foremen had a perfect score, we had to take all of them on that trip.

"The foreman can stop accidents and the effort to do so results in a spirit of cooperation among them which has beneficial effects far outside the sphere of safety.

Trophy awarded to Van Sciver plant of the Warner Co.

Physical Examinations

"Another thing we have done which has a bearing on safety work is to require all new workmen to undergo a physical examination. At the same time we requested our old workers to be examined. It is interesting to note that, while it was distinctly understood that this examination was not obligatory for those already employed, very few out of about 1500 objected to it.

"These examinations have been of great benefit in that they have enabled us to avoid hiring men who were obviously unfitted for the work which they were to do. The examinations also have disclosed the fact that certain of our employes were performing duties which, because of unsuspected physical impairment, rendered them a menace to themselves and to their fellow workmen. These men were changed to other jobs for which they were better fitted. In a few cases we had to dispense with their services. This, however, was not done except as a last resort.

"Physical examinations also have been of benefit in our compensation work. We know now pretty well the state of health of all of our workers and find this information very useful in claims for compensation. For instance, during the 10 months period immediately preceding the physical examinations, hernia cases alone cost us nearly $1500; while during the 10 months period following the examinations we expended exactly $9.50 on account of alleged hernia.

"Our physical examinations in the Van Sciver plant disclosed a lot of information

which we did not have. We found the record very much worse than anywhere else in the company. We found that the men were not being examined and we were, in a sense, taking rejects from other companies. A truck driver couldn't see across the room. The day after he was examined (an eye examination following a physical) he went off the road. The report came in that he couldn't see across the room. We found several men color blind, and we either had to change their jobs or get rid of them. One man who was color blind drove a truck for 25 years and hasn't had an accident. A crane operator only had one eye. He had operated the crane for five years and was the best man we have had.

"In considering the results of physical examinations we have to use judgment and common sense. We change the man to work that he can do; we don't get rid of him. We have worked entirely through the foreman. We have tried to get him to see that safety is a part of his job. We have gone entirely on the basis of educating him, and that education has borne fruit. We have shown the foreman the benefits derived and he has responded to that treatment."

Phosphate in Tennessee

THE LARGE CONTRACTOR who was mining phosphate on Bear Creek has discontinued operations, it is reported. Small operators are producing as much as possible, but lack of supply has resulted in the furnace consumer buying a large part of his requirements from Florida.

The country is being scoured for lump rock which can be mined profitably at present prices, but little rock of that kind is left in the field. Owners are not inclined to permit their lump rock to be mined alone, as this takes only about half of the tonnage from the very best mines; in most fields not more than one tenth.

Following election it is generally felt in this district that legislation of the new administration will be more favorable to agriculture, which should result in greater consumption of fertilizer. It is also hoped that proper disposition of Muscle Shoals will increase consumption of phosphate from the Tennessee field. A plan under consideration should make possible the utilization of this project to the maximum benefit of farmers of the Mississippi Valley and phosphate producers of this district as well.

Rock prices generally are holding firm with little buying noted.

Motor Drives for Rock Products Plants

IN a recent publication, "Which Motors for Your Rock Products Plants," the General Electric Co. shows which types of motors are best adapted to various machines, such as crushers, pulverizers, tube mills, kilns, feeders, conveyors, etc., used in the rock products industry.

Squirrel-cage, wound-rotor, synchronous and super-synchronous motors are recommended for crushers and pulverizers depending upon the flywheel effect of the machine. Super-synchronous and synchronous motors are recommended for tube mill drives because of their high efficiency and low starting current.

Direct-current and Type BTA adjustable-speed alternating-current motors are advised for rotary kiln drives where speed regulation at varying loads is desired, wound-rotor motors where accurate speed regulation is not required, and squirrel-cage motors for simple constant-speed drives.

Squirrel-cage motors with normal or high starting torque are recommended for conveyors, feeders, etc., depending upon the starting duty. Wound-rotor motors are advised where variable speed and high torque with low starting current are desired. Type BTA adjustable-speed alternating-current motors are also advised where speed control is desired. This control may be manual, remote or automatic. Direct-current motors are also advised where accurate speed control is desired and when direct current is available.

Such factors as power supply, demand charges, available space, maintenance, production speed, etc., enter into the choice of a drive and the company offers complete engineering service in the selection of the right electrical equipment for each condition.

Exposition of Power and Mechanical Engineering

THE TENTH National Exposition of Power and Mechanical Engineering will be held at the Grand Central Palace, New York, N. Y., December 5-10. Two years have elapsed since the last exposition and in the interim many lines have been completely revamped.

During the past two years manufacturers have been giving much attention to improvements in fuel preparation and fuel-burning equipment, to the collection of cinders and fly ash, refinements in furnace walls to lessen outage and maintenance, and to the employment of materials better able to withstand the exacting demands of service. In the field of accessories, numerous instruments and meters have been developed to more accurately record temperatures, flow and leakage, to the end that waste may be more readily detected and prevented. Draft gages for zoned air control have been perfected as well as devices for maintaining the proper ratios of feed water treatment. Several improved water-level indicators have been developed to overcome the ever troublesome water-level problem of modern boiler operation. Traps have been redesigned to minimize leakage and maintenance, and refinements have been made in valves and fittings to better withstand high-temperature service. Automatic control has made marked progress through the employment of the electron tube and a maximum of operating precision is now attainable.

These are but a few of the many things that will be displayed for the visitors to the show.

Commercial Development of Potash from Dead Sea

THE Dead Sea, worthless in the eyes of the world for centuries save as a curiosity is being worked as a potash mine by a British chemical company, the *New York* (N. Y.) *Times* reports.

The first shipment to the United States arrived several weeks ago and was purchased by a commercial fertilizer company. The second shipment is due the first week in December. The first shipments went to England, where it was sold at $20 a ton, or about one-half the price of German potash on the British market.

According to Department of Commerce reports, studies of the mineral wealth of the Dead Sea indicate that it is likely to be one of the world's great sources of chemicals. Besides potash, the waters hold millions of tons of calcium chloride, common salt, magnesium bromide and magnesium chloride.

When the first water was pumped two years ago it was taken from the surface of the sea, but now the pumps reach to a depth of 175 ft., where the contents of potassium and bromide reached a maximum of 50%.

Borium and Borod

BORIUM, according to *Fusion Facts*, published by the Stoody Co., Whittier, Calif., is a tungsten carbide, being a combination of WC and W_2C. It has a hardness of 9 on Moh's scale, on which scale the hardness of a diamond is 10. It is used chiefly as a cutting medium and wear resisting covering.

It is generally used in the form of tube borium, which is borium of ⅛-in. to 40-mesh size encased in mild steel tubing of 3/16-in., 5/16-in. and ⅜-in. sizes. An improved form is stainless steel borium where the borium particles are enclosed in stainless steel tubes containing 18% chromium and 8% nickel.

Borod has the same chemical characteristics, but is smaller in particle size, 40- to 90-mesh. It differs from tube borium in that the smallest particles form a matrix of 70 hardness on the Rockwell C scale in which are embedded small grains of tungsten carbide.

Street Design, Construction and Maintenance

BULLETIN 33, issued by the American Road Builders Association, reports on construction practices in street work and discusses maintenance of various types of surfaces.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Ready Mixed Concrete at the Hoover Dam

This Largest and Most Modern Concrete Mixing Plant Is the Last Word in Accuracy and Control

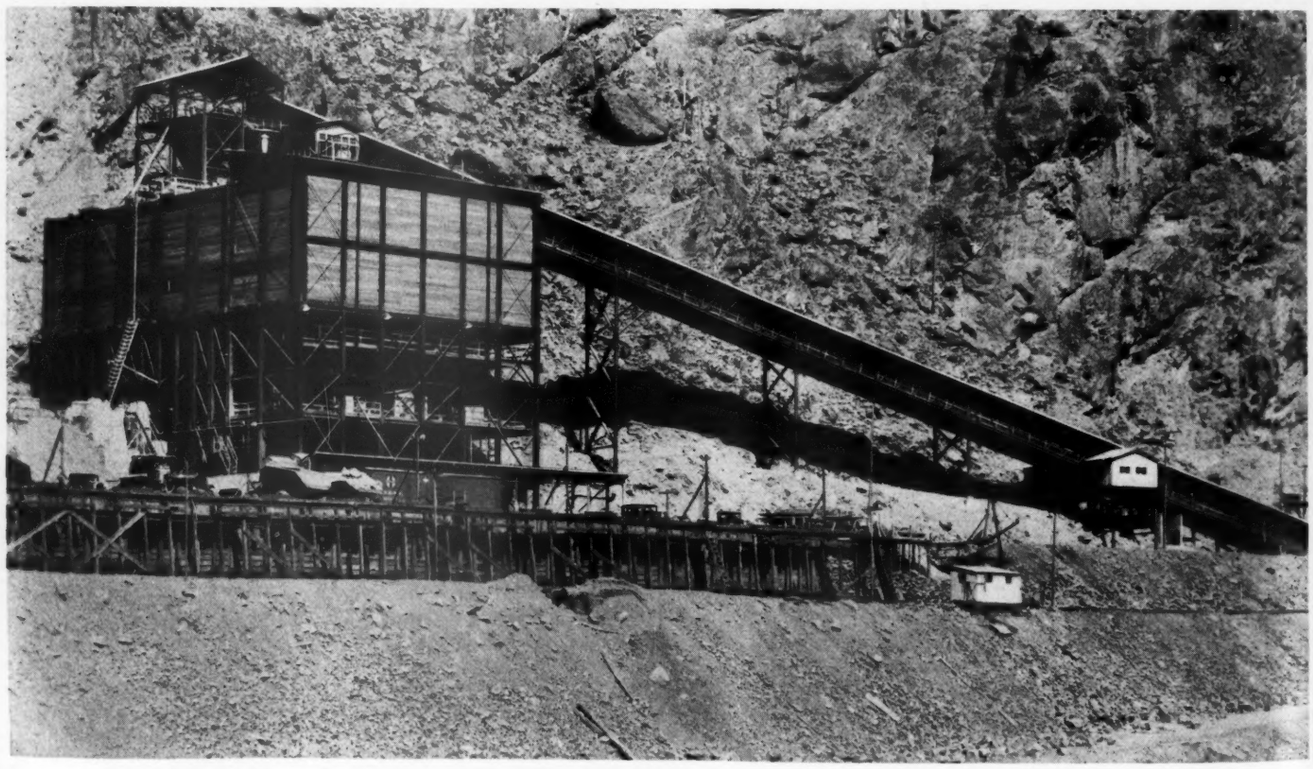
By Walter B. Lenhart
Associate Editor, Rock Products

THE CONSTRUCTION of the Hoover dam will call for the placing of 3,400,000 cu. yd. of concrete in the dam proper, making it the largest single piece of monolithic concrete ever constructed. It is estimated that two and one-half years of continuous pouring will be required to complete the dam proper and once the pour starts the engineers do not anticipate any stoppage of the work. It is also estimated that the rate of pouring will at times run as high as 500 cu. yd. per hour.

Equipment to pour this mass of concrete has been installed at the dam site and is now being used for lining the four diversion tunnels that will carry the waters of the Colorado river while construction of the dam itself is being pushed forward. The various units necessary to carry on this work are not permanently located as in the usual ready mixed concrete business, but as the work moves forward the units must be moved forward also.

So we find at present a ready mixed plant having four 4-yd. Smith mixers which later will be increased to six mixers. When the lower two-thirds of the dam has been poured the entire ready mixed plant will be dismantled and moved to a higher elevation and the top third of the dam poured. The present plant is located about 2000 ft. above the upper portals of the tunnels in a narrow portion of the canyon where the walls of the canyon rise vertically on either side several hundred feet above the plant. Part of the plant and the railroad serving it is all on filled ground.

At present the concrete is handled by a fleet of ten 4½-yd. Rex agitators mounted on White trucks. These trucks deliver the material over a roadway that has been cut through the solid rock to reach the upper



General view of low-level concrete mixing plant at Hoover dam

Concrete mixing plant viewed from a point above the future location of the dam

Looking upstream from a point above the lower portals. The dam will be located about half way between bridges

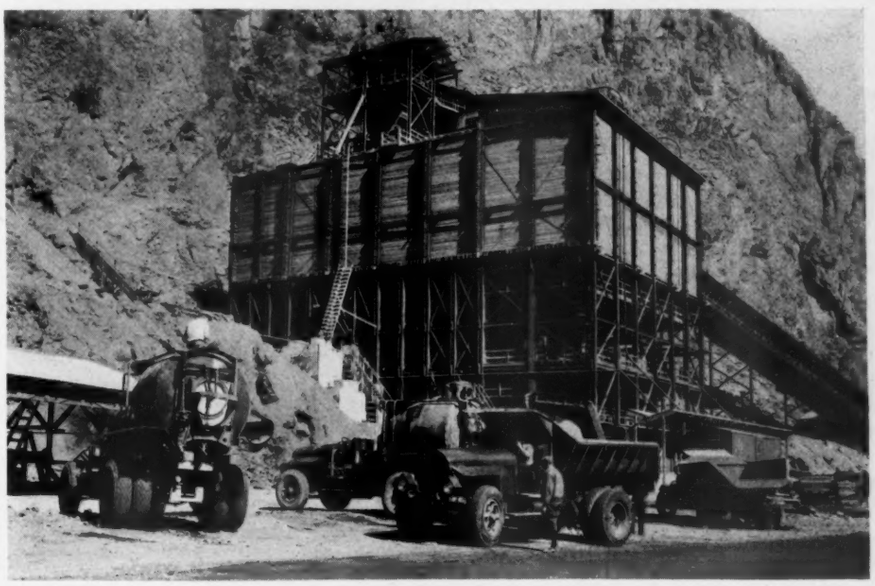
portals of the four tunnels. For part of the distance this roadway is a tunnel.

The Colorado river has a flow of 5000 to 200,000 second feet, all of which has to be diverted so that the footings for the dam proper can be set. To carry this flow of water four huge tunnels have been driven around the proposed dam site, two being located on the Nevada side and two on the Arizona side. The mining work on these tunnels has been completed, although some muck left in the bottoms of the tunnels is still being moved out by means of Marion electric shovels and a fleet of trucks. Caterpillar tractors with bulldozers have been used for scraping or pushing some of the scattered muck up to the shovels.

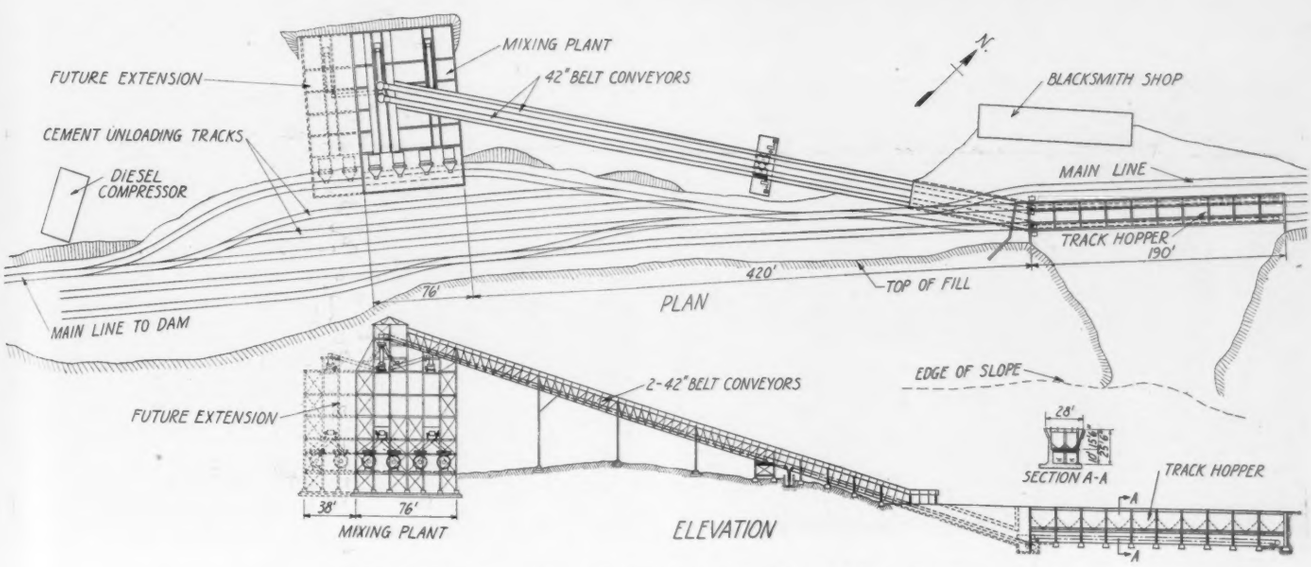
Methods Used in Lining Tunnels

The tunnels are 56 ft. in diameter in the clear and have been driven through solid rock which stands without timbering. Owing to the nature of the rock the bore of the tunnels varies considerably so that when they are lined to an inside diameter of 50 ft. the thickness of the concrete lining will vary from about 2 to 6 ft. The tunnels are each roughly about 4000 ft. long.

The development work incidental to the lining of the tunnels is perhaps the most

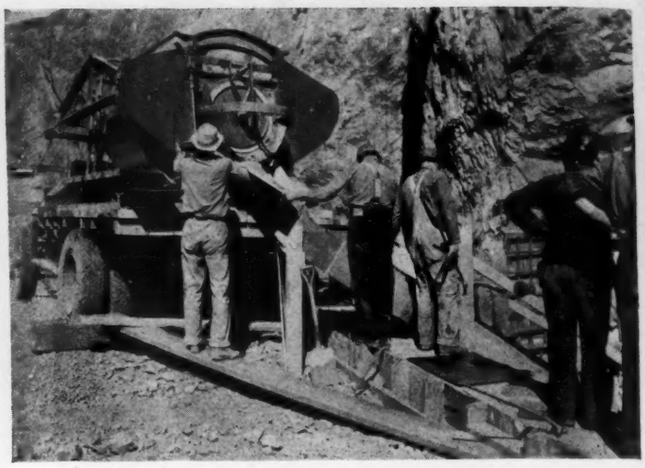


End view of concrete mixing plant



General arrangement of low-level concrete mixing plant

Mixing truck used between plant and tunnel portals



Mixing truck discharging at tunnel portal

interesting phase of the entire construction job. Visitors are for the most part not allowed to enter the tunnels but must be content with viewing the canyon from observation points above the dam site. Even to get into Boulder City one must pass the inspection of a Federal marshal, as the entire area is a Federal reservation. The writer was allowed to visit the tunnels so that first-hand information could be made available on the concrete phases of the work.

At first the concrete for the tunnels was handled twice, being delivered to the portals of the tunnels in the Rex truck mixers, and then chuted to other trucks which operated in the tunnel proper. A fill in front of the portals, constructed to keep back the waters of the river and some 35 ft. above the bottom of the tunnel, prevented the truck mixers from entering. The second fleet of trucks did not use mixer bodies but handled two 2-yd. buckets or containers resting on the flat deck of the truck. This load was delivered in the tunnels to points where any of the several electric cranes could take the buckets and dump them into the steel forms.

This plan was later changed so that the agitator trucks were run directly into the tunnels by using timber ramps.

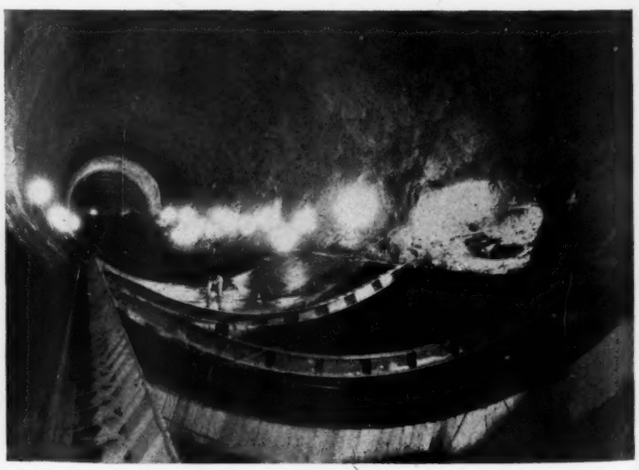
The first step in the pouring of the tunnels is the construction of two parallel piers about 35 ft. apart which carry the rails for the electric cranes. When these piers and rails are in place the muck in the bottom is cleaned out, which is necessarily hand work owing to the uneven nature of the bottom. The rigid inspection of the engineers of the Department of Reclamation calls for careful cleaning out of all the pockets in the bed rock. When the bed has been cleaned, the bottom or invert section is poured. To do this the trucks deliver the buckets of concrete to a point as close to the work as possible and the electric crane conveys the buckets two at a time to the point of use. While the invert section is being poured, the side walls at other locations are also being poured so that pouring of several parts of the tunnel lining is carried on simultaneously at different points. Speed and control of the quality of the product is evident on every hand, with several thousand men engaged on different phases of the work and with government inspectors at all parts of the work to see that no detail is overlooked.

It is expected that the placing of the 400,000 cu. yd. of concrete in the four tunnels will be completed by January when the Colorado river is at its lowest stage so that the diverting of the water into the completed tunnels can be easily accomplished by a simple drag line operation. Soon thereafter the construction of the upper coffer dam will be started. This temporary dam will be of gravel and rock construction but will be solid and substantial in character. The upper face of the coffer dam will be of concrete and the back of rubble. A total of 4,500,000 cu. yd. of concrete will be poured at the Hoover dam, including the concrete lining necessary for the tunnels.

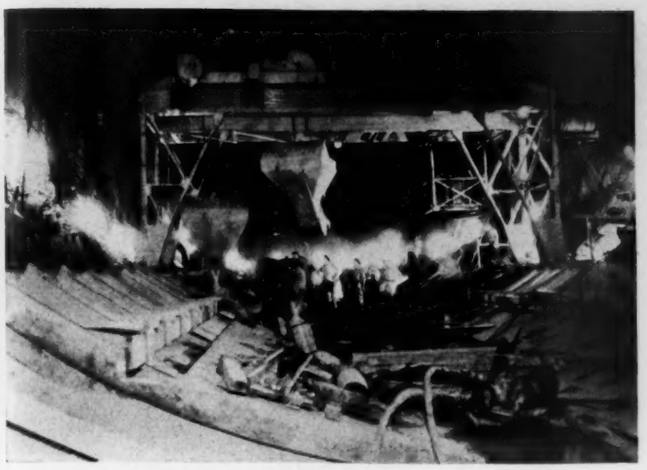
Material Handling Methods

The sand and gravel which is used as aggregate is hauled a distance of about 4 miles in standard gage cars from Junction City, where the sand and gravel washing and screening plant is located. This sand and gravel plant was fully described in Rock Products, August 27, 1932.

On arrival at the mixing plant the cars are dumped to a track hopper having five compartments. Each compartment is 39 ft. long and 30 ft. deep and holds 300 cu. yd.



Two views of the diversion tunnels, showing truck being loaded at portal, at left. The rail piers for the crane are poured first, then the bottom section



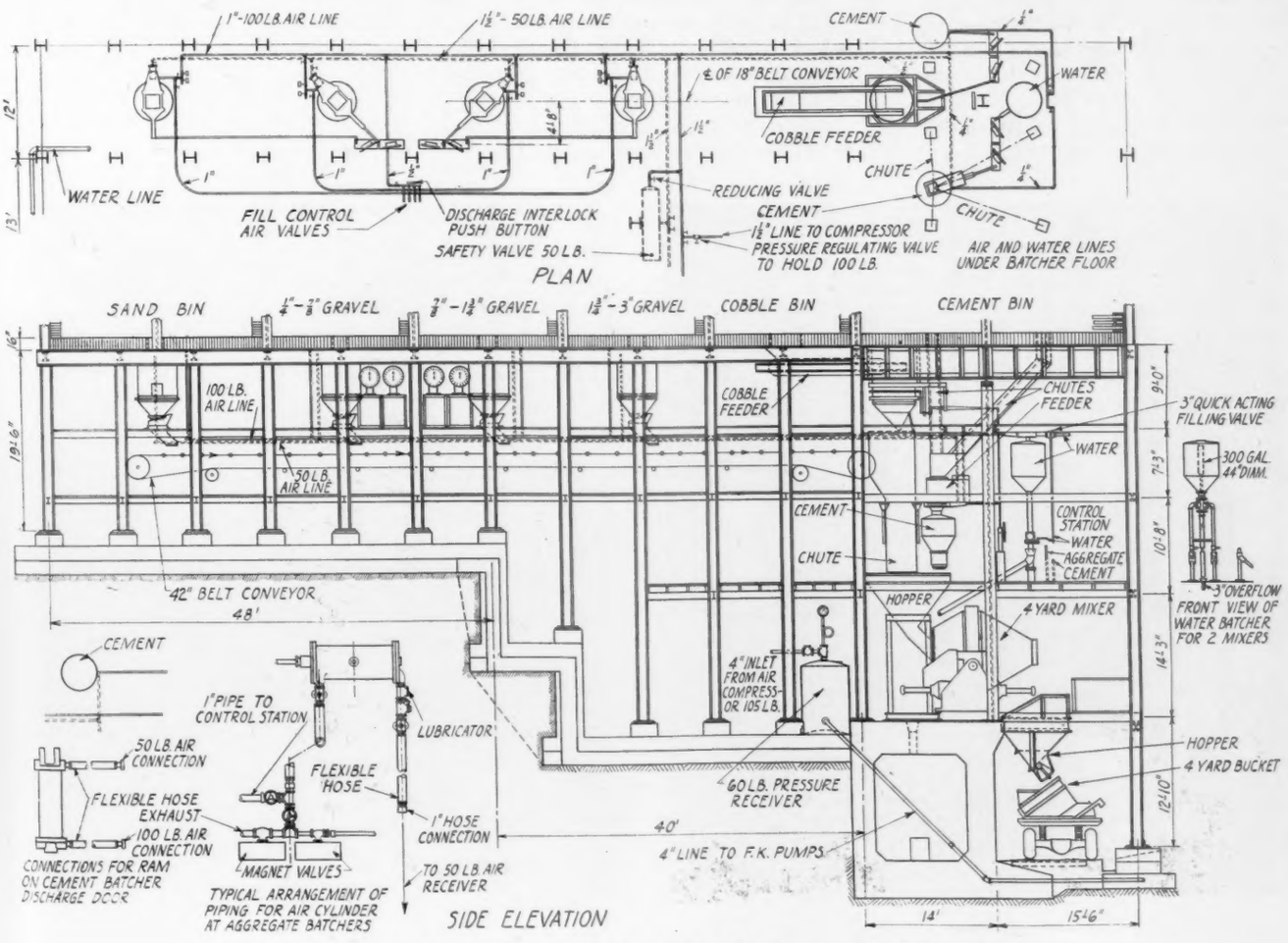
Tunnel views showing the pouring of the bottom section and the handling of buckets by the crane

or 10 cars of material. Below the track hopper are two 42-in. belt conveyors fed by a total of 20 motor-operated gates, four gates to each compartment.

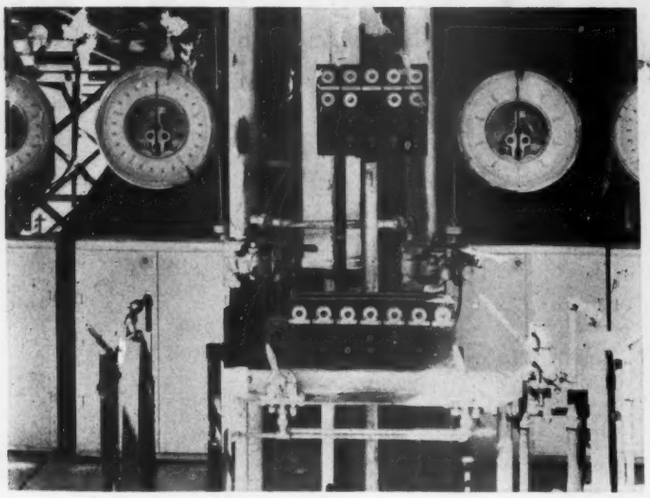
The two conveyors are 519 ft. long and have a lift of 150-ft. Each is driven by a 200 hp. Westinghouse motor through a Falk gear reduction unit. The belts are 9 ply and of 32 oz. duck construction and were supplied by the Pioneer Rubber Co. of Pittsburgh, Calif. The carrier rollers are of the five-roller type, provided with anti-friction bearings, and were supplied by the Stearns Conveyor Co. The pulleys and driving mechanisms were supplied by Link-Belt Co.

The conveyors discharge through a rotary chute and shuttle conveyor to five aggregate bins above the batchers. Each bin holds sufficient aggregate for a 12-hour run, or 36 carloads of sand and 30 carloads of each of the larger sizes of aggregate, a total of 156 carloads. The bins have a depth of 30 ft. and are of timber crib construction with steel columns and beams. The conveyors can be operated so that a different material can be carried on each of the two belts at the same time.

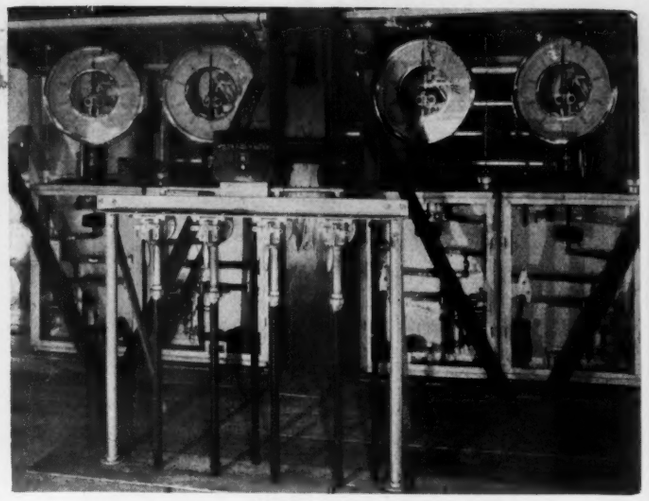
Cement is received at the plant in bulk and is unloaded by two Fuller-Kinyon portable pumps which deliver it through 5-in.



Sectional elevation and partial plan of low-level concrete mixing plant



Dial scales and control equipment used for the batching of cement and water



Dial scales and control equipment used for one set of aggregate batchers

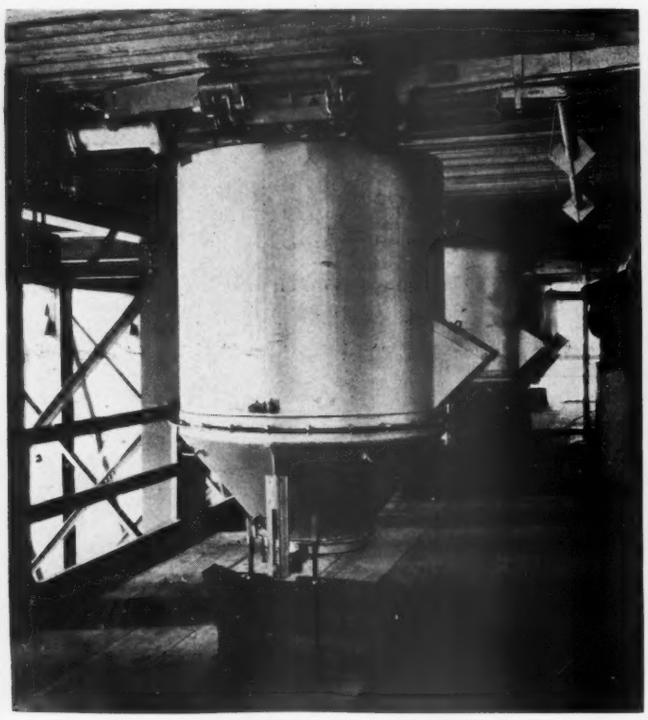
pipe lines to a rectangular storage bin. Each pump is driven by a 40-hp. motor. The storage bin will hold 12,500 bbl. of cement or 50 cars of 250-bbl. each. Only one grade of cement and no admixtures or quick hardening cement is used. The cement is hauled a distance of 16 miles from Boulder City to the mixing plant.

There are two complete sets of batchers for the four mixers, or one set of batchers for two mixers. The five aggregate batchers in each set are mounted in a row and discharge to a 42-in. horizontal belt conveyor located directly below them. These batchers were supplied by the C. S. Johnson Co. and are the last word in aggregate batching and weighing equipment.

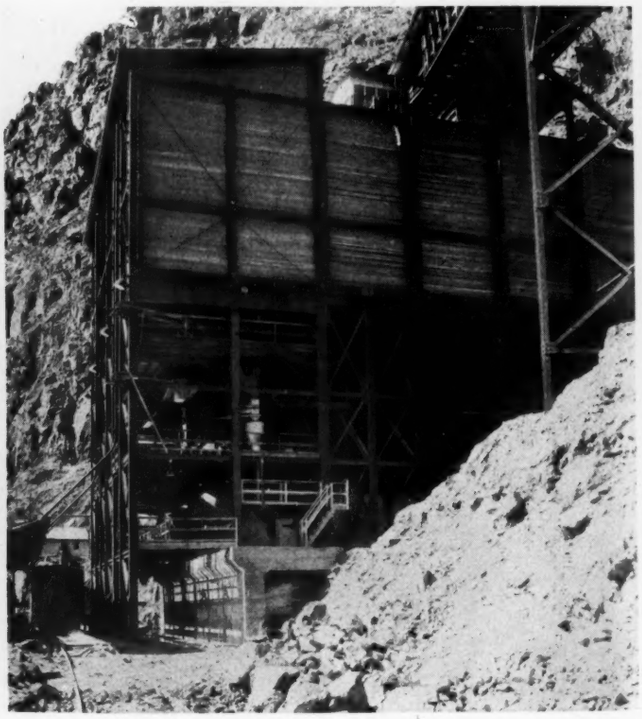
In operation, the sand is first dropped to the belt, followed by the next coarser aggregate and lastly by the cobbles (3-in. to 9-in. size). Feeding the aggregates to the belt in this manner not only protects the belt from excessive wear but permits of a superficial blending before mixing. A cement batcher and a water batcher are used for each mixer.

The sand and gravel batchers are each filled by means of an air-operated slide gate which is controlled by a mercoid switch. The gate at first opens wide until the batcher is about filled, after which the remaining aggregate is dribbled into the batcher by a rapid opening and closing of the gate. This method makes for greater accuracy in weighing. The large aggregate, or cobbles, ranging in size from 3-in. to 9-in., is fed to its batcher by a Jeffrey apron conveyor. This batcher is provided with the same jog control as the other batchers. The cement is fed to its weighing batcher by a motor-driven screw feeder and the water is controlled by a balanced valve.

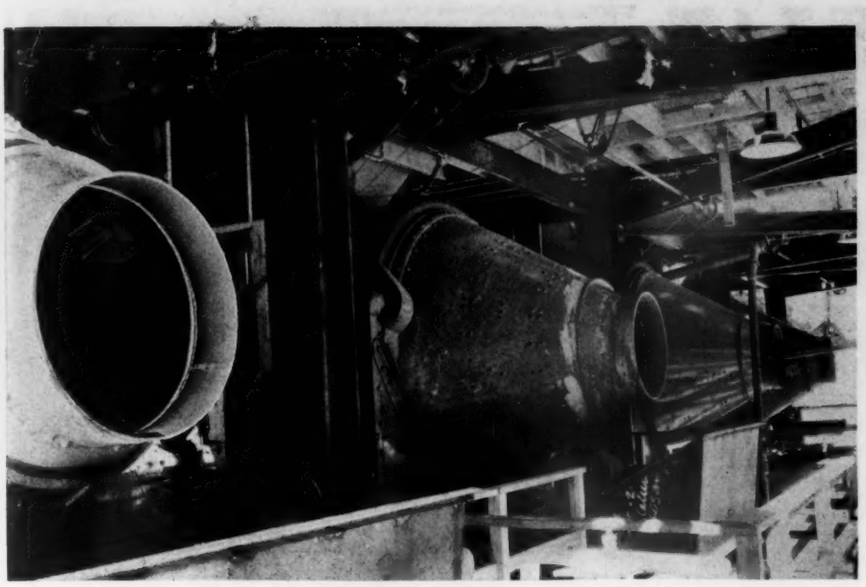
Each pair of mixers is controlled from a control station located between the two mixers and the operator is provided with two cement dials, water and cobble weighing dials. Dials and hand control mechanisms are located near each set of aggregate batchers and these can be used instead of the



One set of aggregate batchers which discharge to belt conveyor below floor



Partial end view of concrete mixing plant, showing discharge point of mixers



Battery of four 4-yd. mixers now installed

automatic system. In normal operation the operator presses a button which starts the filling of the batchers and the flow is automatically cut off when the required weight is reached. The materials are then discharged to the belt in sequence, after which the batcher starts to fill again. Signal lights are provided which show what batchers are in service. The discharge gates of the aggregate batchers are unlocked by solenoids and are counterweighted to close automatically after emptying. They are also electrically interlocked to prevent filling unless the discharge gates are closed and locked.

An unusual feature is the use of curve drawing instruments which show graphically the consistency of the mix, the time of mixing and the weights of the various aggregates, cement and water used in the batch. Every controllable factor in the mixing of the concrete is recorded on this chart. The determination of the consistency of the mix is based on the horsepower used and its relation to the amount of water in the mix.

The equipment is timed for a three-minute mixing cycle which is made up of 10 seconds to charge, 20 seconds to discharge and 2½ minutes to mix. Each mixer is driven by a 75 hp. Westinghouse motor through a Texrope drive.

The United States Bureau of Reclamation has established a testing laboratory at the mixing plant where tests are made and records kept of the various factors covering the grades of concrete made. O. G. Patch is cement technologist in charge of this work. The specifications call for weighing accuracy within 1% of the cement and water and within 2% for the aggregates. In the tunnel lining a mix of 1 part cement to 6.8 parts aggregate, requiring about 5 sks. of cement per cubic yard, has been used. The mix for the dam proper will probably be about 1 part cement to 9 parts aggregate, by weight, or about 1 bbl. cement per cu. yd.

Effective Credit Management

AN OUTLINE of some credit and collection policies and practices which have been employed effectively by manufacturers and wholesalers, is given in a new report, "Effective Credit Management," published by the Policyholders Service Bureau of the Metropolitan Life Insurance Co. The information is set forth in factual form with the thought that the methods described may be of value to business men in dealing with their own credit problems.

After analyzing the reasons for a credit service in industrial organization and listing the general policies in force, the report discusses in some detail the various major aspects of this service. These include the investigation or appraisal of the credit risk; the determination of limits within which credit safely may be granted; the fixing of terms of payment; and the ultimate collection of the account. The study outlines some of the devices used effectively in the development of an adequate current control over all credit and collection activities. Several forms used in connection with the methods described are reproduced in the report.

Reports Increased Business

T. AUBREY SAUNDERS, manager and president of the Highland Park Sand Co., Inc., Richmond, Va., recently reported that business in August and September has increased from 20% to 30% over the average for the past three years in the same period. "In molding sand our business has increased 50% and in other lines approximately 25%," he reports. As a result, plant capacity is being increased and a salesman added, the *Richmond News-Leader* reports.

Sand-Lime Brick Production and Shipments in October

THE FOLLOWING DATA are compiled from reports received direct from producers of sand-lime brick located in various parts of the United States and Canada. The accompanying statistics may be regarded as representative of the industry.

Fourteen sand-lime brick plants reported for the month of October, this number being two less than the number reporting for the month of September, statistics for which were published in our issue of October 22.

The number of plants reporting for the month of October being less than the number which reported for the previous month, we estimate there is a slight decrease in production, as well as in rail and truck shipments. Stocks on hand, however, remain about the same, and an increase is shown in unfilled orders.

Average Prices for October

Shipping point	Plant price	Delivered
Detroit, Mich.	$10.50	$11.50
Flint, Mich.	11.50	13.00
Grand Rapids, Mich.	.....	12.50
Medfield, Mass.	8.00	10.00-12.00
Milwaukee, Wis.	8.50	10.50
Pontiac, Mich.	10.50	12.50
Saginaw, Mich.	10.00	.....
Syracuse, N. Y.	18.00	20.00
Toronto, Ont., Can.	12.00	13.50

Statistics for September and October

	†September	*October
Production	‡2,523,072	2,187,175
Shipments (rail)	454,900	300,000
Shipments (truck)	1,807,506	1,668,169
Stocks on hand	5,897,620	4,813,167
Unfilled orders	2,253,846	3,650,000

†Sixteen plants reporting; incomplete, one not reporting stocks on hand, and six not reporting unfilled orders. ‡Includes 28.222 double brick. *Fourteen plants reporting; incomplete, six not reporting unfilled orders.

Notes from Producers

Medfield Brick Co., Medfield, Mass., reports that it has received an order for sand-lime brick for Rockland, Mass., post office.

Walker and Frank Brick Co., Detroit, Mich., is now delivering sand-lime brick for the post office building at Detroit.

Material Men Favor More Gas Tax Funds for Cities

ROAD MATERIAL interests in Akron and Summit county, Ohio, have assured Mayor Sparks that they are entirely in sympathy with his proposal to have the state legislature enable reallocation to its source of 75%, or thereabouts, of the state gasoline tax, to be used in street widening, pavement and similar work.

The road materials men endorsed the plan at a meeting, and another conference on the subject is to be held in the near future.

Plans under consideration call for united action by road material men when the legislature convenes, for reallocation of a greater portion of the gas tax to cities where it originates.—*Akron* (Ohio) *Beacon-Journal.*

Transporting and Handling Bulk Commodities

By R. F. Bergmann
Chief Engineer, Link-Belt Co., Caldwell-Moore plant, Chicago, Ill.

THE development of special bulk commodity carriers and the improvements in bulk handling methods and in batching and proportioning have reached an interesting and significant stage. Producers, dealers and users of rock products might profitably investigate possible savings through the use of a number of schemes which have been successfully applied during the past few years.

This article reviews some of the methods already described in trade papers and also describes several recent schemes which offer possibilities for the economical shipping and handling of rock products.

Even with the introduction of special vehicles for bulk materials, the use of standard railroad box cars for shipping free-flowing materials has increased. Due in part to effective and economical unloading equipment, requiring a minimum of labor and time, the box car will probably never be replaced entirely by other methods of transportation. Box cars also have the advantage of being available when needed.

Typical mechanical handling units for unloading bulk cement from standard railroad box cars are shown in Figs. 1 and 2. While the plants illustrated were specially designed for concrete road paving operations, the same scheme can be used for permanent installations handling pebble lime, ground lime, bulk soda ash and other products of a similar nature. The plants shown have a capacity of 25 to 30 tons per hour.

These units make use of an automatic power unloading shovel for pulling the material to the car door, where it is discharged into a hinged hopper of sufficient capacity to accommodate the intermittent charges of material. A screw feeder from this hopper regulates the feed quite uniformly to the bucket elevator or vertical screw lift. Many refinements in the design of these plants have been worked out in the past two or three years, to the point where they are practically standardized pieces of equipment, available at reasonable cost, and inexpensive to operate.

For free-flowing bulk commodities such as cement, ground and hydrated lime, soda ash and similar granular or pulverized materials, the vertical screw lift has been developed into a very successful and practical elevating medium for many operations, even of fair size and capacity. Fig. 3 shows one of the vertical screw lifts with an enclosed lubricated bottom gear drive and offset

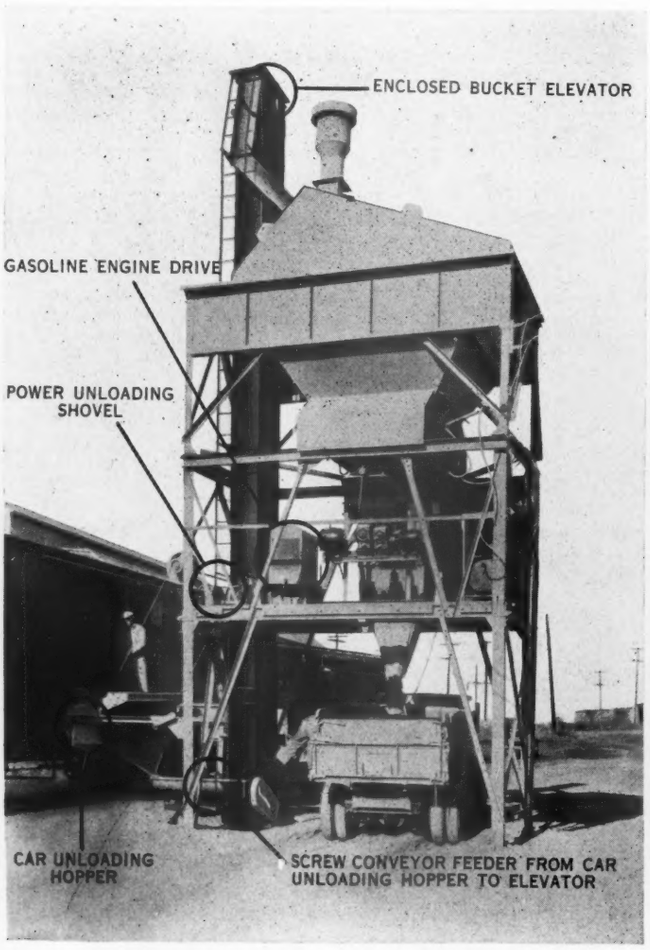
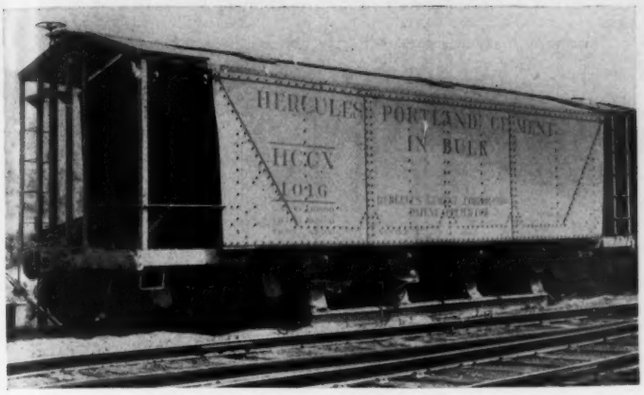

ENCLOSED BUCKET ELEVATOR
GASOLINE ENGINE DRIVE
POWER UNLOADING SHOVEL
CAR UNLOADING HOPPER
SCREW CONVEYOR FEEDER FROM CAR UNLOADING HOPPER TO ELEVATOR

Fig. 1. Unloading unit for handling bulk cement from standard railroad box cars

Fig. 2. Similar unloading unit equipped with vertical screw lift instead of bucket elevator



Fg. 4. Special bulk cement car with eight outlets

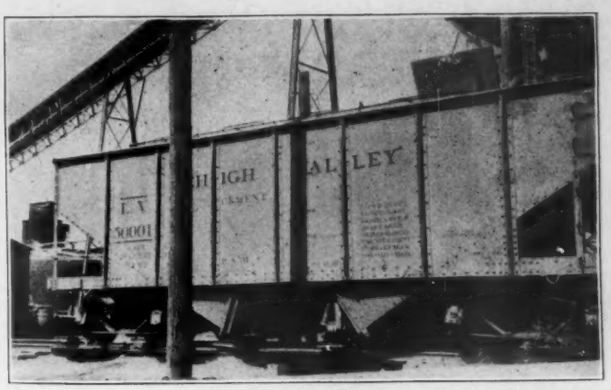


Fig. 5. Typical converted hopper car for bulk cement

Fig. 3. Vertical screw lift with enclosed lubricated bottom gear drive

feeder. The horizontal screw feeder may be arranged to accommodate box car unloading hoppers as shown in Fig. 2, or special bulk commodity cars as illustrated in Figs. 6, 7, 8 and 12. The vertical screw lifts are obtainable as standard units with 6-, 9- and 12-in. diam. screws and with capacities ranging from 5 to 50 tons per hour for commodities weighing from 20 to 100 lb. per cu. ft.

Many improvements have also been made during the past year or two in the design of light, portable bucket elevators. The elimination of pits entirely, improvements in weatherproof, dust-tight construction, and accessibility are some of the things which have been worked out. The practicability of the bucket elevator is well known.

Methods of transporting bulk commodities in railroad container cars were illustrated and described in Rock Products, April 9, 1932. These operations generally involve the use of overhead cranes, locomotive cranes or crawlers, and where such equipment is available at reasonable cost or convenience, container cars have been successfully used.

Cars for Handling Bulk Commodities

The bulk cement car shown in Fig. 4 was developed and introduced several years ago by the Hercules Cement Corp. of Philadelphia. It is a covered multiple hopper car of all-steel construction, with four hoppers and outlets on each side. Gasketed hand slide gates are provided at the bottom of each hopper and a flexible extensible spout, attached to each hopper outlet, delivers the bulk cement to parallel screw conveyors secured to the ties of the track. The two longitudinal conveyors in turn feed a cross conveyor which delivers to the bucket elevator, vertical screw lift, cement pump or other handling medium. The Hercules car is a refinement of several earlier designs by other producers in the rock products industries. The outside hopper outlets provide more accessibility for attaching spouts than some of the earlier designs.

The economies possible through the use

Fig. 9. Self-unloading bulk cement truck trailer

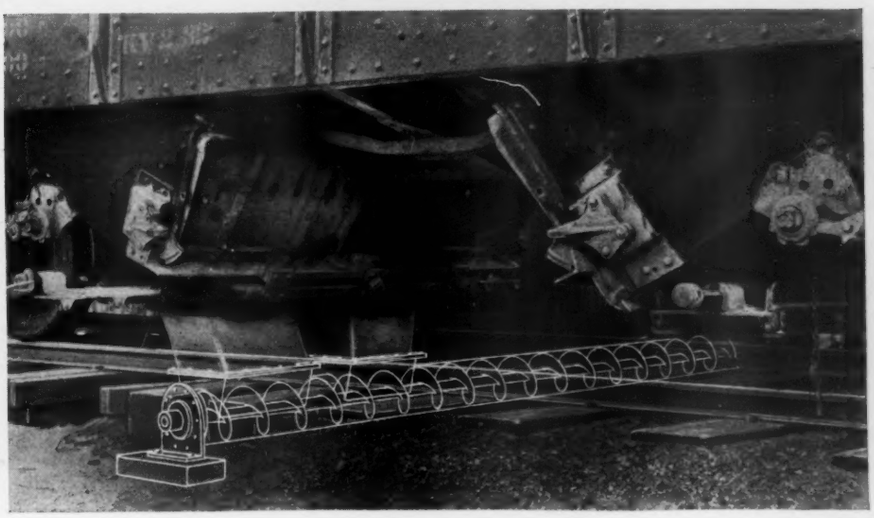
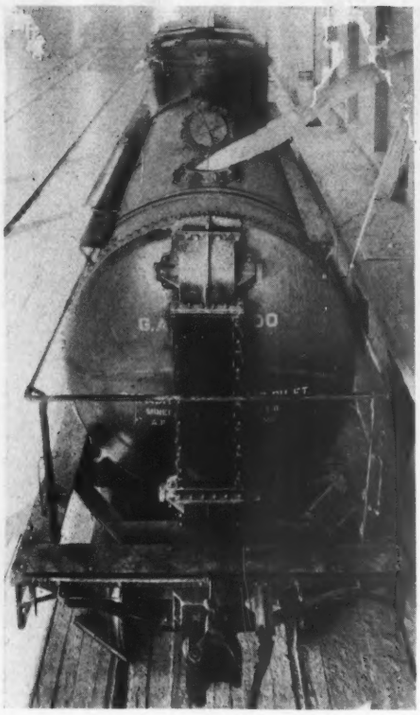
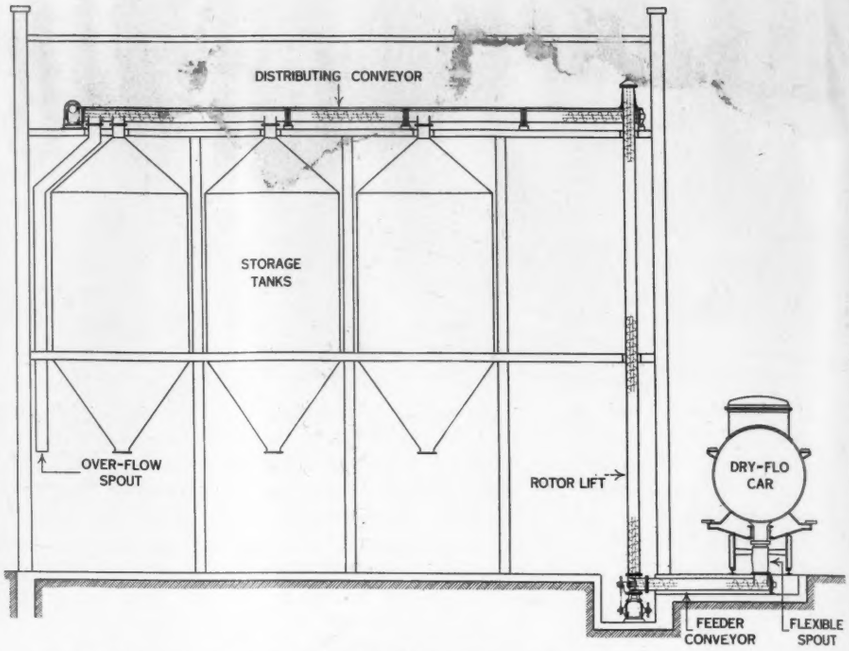


Fig. 6. Details of bottom outlets of bulk cement hopper car and connections to track conveyor





At left, Fig. 11, end view of self-unloading tank car; above, Fig. 12, typical installation of handling equipment for use with tank car

of special hopper-bottom carriers for certain bulk commodities have attracted the attention of a number of Eastern railroads. Taking advantage of the idleness of certain old hopper-bottom cars, some of this equipment has been converted into bulk cement cars, which are also practical for other free-flowing bulk materials.

Prominent in this have been the Lehigh Valley railroad, the Baltimore and Ohio, the Pennsylvania, the Delaware, Lackawanna and Western, the Lehigh and New England, the Reading railroad, and the Jersey Central. Fig. 5 shows a typical converted covered hopper-bottom car, which incorporates a number of features indicating that considerable thought has been given to the handling of bulk cement and to the ease of

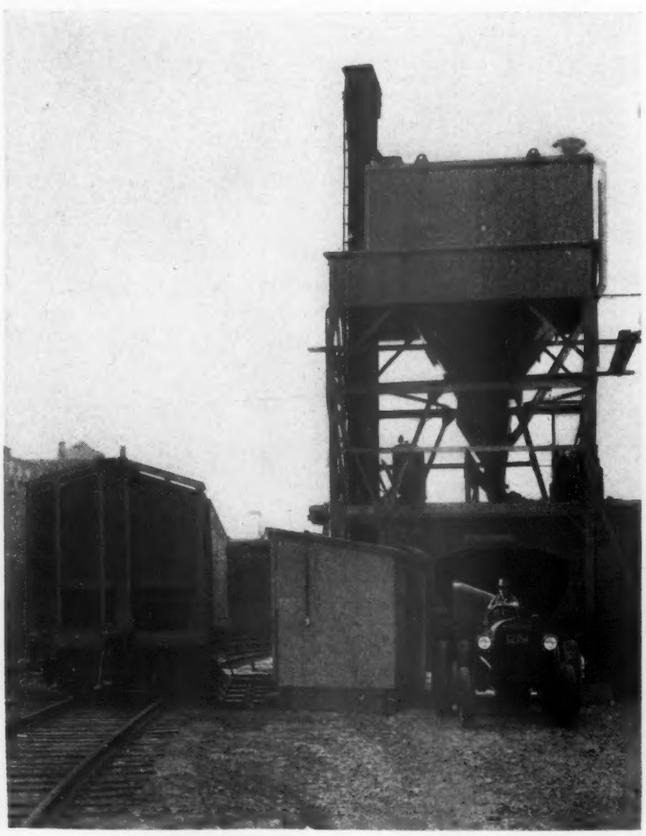


Fig. 7. Unloading bulk cement from special cars and batching to self-unloading truck trailers

Fig. 8. Vertical screw lift being used to elevate bulk cement from hopper-bottom cars to batching bins

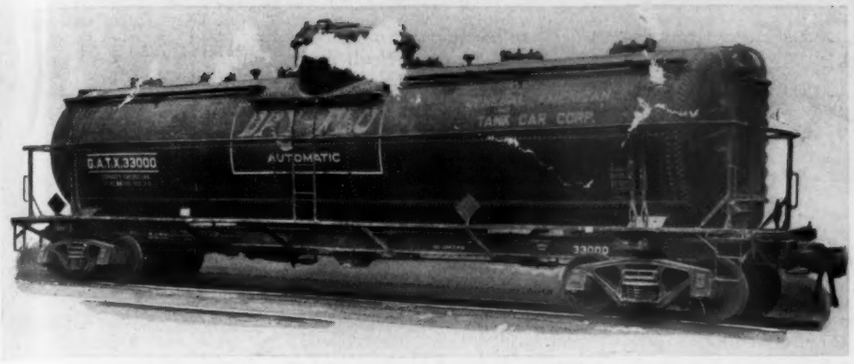


Fig. 10. Self-unloading tank car for bulk materials

operating cut-off slide valves, making connections to conveying equipment, etc. Fig. 6 shows a detail of the bottom outlets and track feeder connections on a D. L. and W. bulk cement car operation.

Fig. 7 shows a typical unloading operation of Hercules cement cars at the bulk cement unloading plant of the Boston Concrete Co., Cambridge, Mass. The central concrete mixing plant of the company is located about a half-mile from the railroad siding and the cement is unloaded at the siding as shown in the illustration and trucked to the mixing plant.

The track conveyors consist of 9-in. diam. screws in pipes. This special screw conveyor system is connected with a bucket elevator which discharges to the overhead cement bin. From this bin the material is discharged to self-unloading truck trailers.

The Hercules cars each have a capacity of about 400 bbl. (70 tons) of bulk cement. Due to the number of outlets provided, the unloading rate can be high, depending largely upon the equipment beyond the car for feeding and elevating the material to bins or storage.

Self-Unloading Trucks and Trailers

The company's self-unloading bulk cement truck trailer is shown in Fig. 9. The body holds 60 bbl. of bulk cement and is a modification of one which was built by the Huron Portland Cement Co. of Detroit. In the bottom are located two 9-in. diam. extra heavy double flight helicoid screw feeders, mounted on solid shafts, with roller bearing thrusts at the forward end and special removable sleeve bearings at the rear end.

The screw conveyors are driven by a 30-hp. Hercules gasoline engine through double width steel roller chain drives.

At the company's central mixing plant the trailer truck is backed into a shed and the material is unloaded into mechanical handling equipment. The truck is completely unloaded in 15 minutes by the two 9-in. screw feeders. The gasoline engine easily starts the conveyors when the body is fully loaded with cement.

Fig. 8 shows a complete plant for the unloading and batching of bulk cement from hopper-bottom cars, incorporating a horizontal screw feeder and a vertical screw lift. The simplicity and economy of the unloading equipment is obvious. Plants of this type have a normal capacity of 3 to 5 cars daily, depending upon the requirements and the speed with which the cars can be shifted or handled.

Automatic Self-Unloading Tank Car

The "Dry-Flo" automatic self-unloading tank car of the General American Tank Car Corp. is another interesting form of special bulk carrier. A description of this car appeared in Rock Products, April 9, 1932.

Figs. 10, 11 and 12 show the "Dry-Flo" car and a typical installation of mechanical unloading, elevating and distributing equipment for use with this car. The "Dry-Flo" car is particularly suited to many products which are difficult to discharge from ordinary hopper-bottom cars or box cars, or which are injurious to workmen or operators. The unloading rate may be greatly varied, depending upon the requirements. The operation of the car is entirely self-unloading and probably requires less labor and time than any other method.

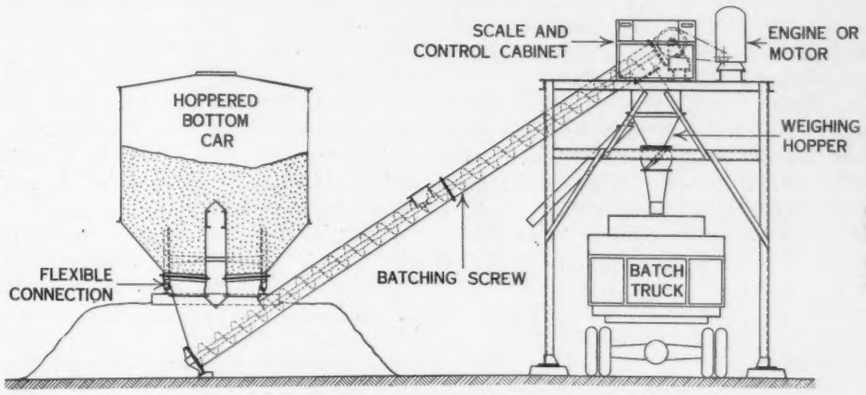


Fig. 13. Economical batching operation where hopper car is used as bin

Fig. 13 shows a clever arrangement for an economical batching operation on a temporary setup. In this case the hopper-bottom car virtually takes the place of the bin and the inclined screw lift becomes the batching unit as well. This inexpensive flexible portable outfit offers possibilities in various rock products operations.

High Speed Truck Unloading Operations

For many short hauls motor truck deliveries are now entirely practical and in general use. One of the principal requirements for truck unloading outfits is high speed operation, so as to tie up trucks for an absolute minimum of time.

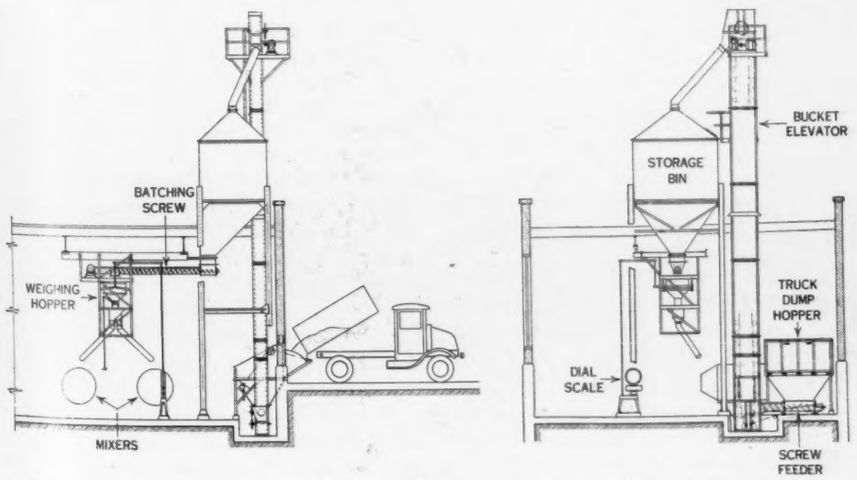


Fig. 14. Installation for handling bulk materials from dump trucks without loss of truck time

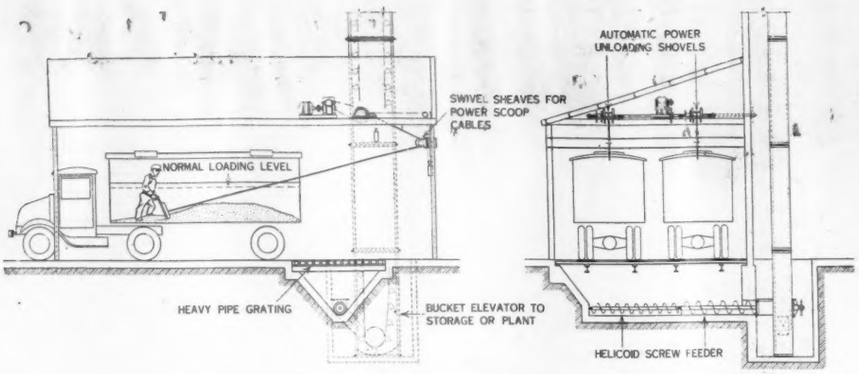

AUTOMATIC POWER UNLOADING SHOVELS
SWIVEL SHEAVES FOR POWER SCOOP CABLES
NORMAL LOADING LEVEL
HEAVY PIPE GRATING
BUCKET ELEVATOR TO STORAGE OR PLANT
HELICOID SCREW FEEDER

Fig. 15. Use of power shovels with large trucks or trailers

Fig. 14 shows a recent installation for handling bulk material from dump trucks, which incorporates a hopper of sufficient capacity to take the entire truck load, thus permitting the truck to get away promptly for another trip. The hopper also provides a small additional ground storage, which at times is convenient. The installation shown in Fig. 14 includes a very satisfactory batching unit for such products as bulk cement, soda ash and similar materials.

Enclosed or covered trailer truck bodies can be designed to accommodate rock products and chemicals, and where legal restrictions permit they may often be the most economical mode of transportation. Mechanical unloading equipment may be used with these trailer trucks as in Fig. 15, illustrating a high speed trailer truck unloading outfit which uses automatic power unloading shovels such as are regularly employed for railroad box cars.

These covered trailer trucks are arranged with end discharge doors, and the operation of a power shovel as shown in the illustration can be very efficient. Unloading capacities as high as 60 to 75 tons per hour may be obtained by the double shovel unit shown.

The foregoing schemes and layouts are shown to indicate some of the ways in which rock products and similar materials may be distributed and handled economically. These schemes have almost unlimited possibilities for certain operations and may be used by both producer and consumer.

How to Get Federal Funds for Relief Work

A PUBLICATION outlining in detail how Federal funds can be obtained for construction purposes for unemployment relief work has been issued by the National Committee for Trade Recovery, New York, N. Y. In states were legislation is needed before cities can avail themselves of Reconstruction Finance Corp. funds for this purpose model acts are suggested. A list, by states, of 214 sewerage systems that are being held up because of the poor market for bonds is given. A similar list of 508 waterworks improvement projects is shown.

Cement Manufacturer Adds Five Products

FIVE new "Colton" brand products have been placed on the market by the California Portland Cement Co., with plant at Colton, Calif.

The new products are a hydrated lime, masonry cement and lime "putty," all of which have required the installation of new equipment, and, after several shipments have been made, these products have been pronounced as entirely satisfactory to the trade.

Another product is a grit, to be used in making chicken mashes. To make this, new screens were installed.

Expansion of facilities and the placing of equipment to enter the new manufacturing fields have been in progress since summer.

The lime plant has been remodeled, a new building being provided in the group and additions made to another. Hydrated lime is packed in 10-, 25- and 50-lb. paper sacks.

The Ore Grande Lime and Stone Co. of Los Angeles and Beverly Hills is the sole selling agent for hydrated lime, just as it has been for Colton lime for years.

The Colton masonry cement, which will be handled both by the Ore Grande Lime and Stone Co. and the Southern California Portland Cement Co., will be sacked in 75-lb. containers, and is a special mix in demand for several types of masonry work. Beside the chicken grit the company makes fertilizer products at the Colton plant.

Pulverizing machinery, air circulating devices, grinders, elevators and other equipment have been installed this year, in addition to a Bates sacking machine.—*San Bernardino* (Calif.) *Sun.*

Announce Plans for New Gravel Plant in San Francisco Area

CONSTRUCTION of a gravel plant on the Arroyo del Valle, near Livermore, Calif., to cost $500,000 is to proceed immediately, officers of the Coast Rock and Gravel Co. announced when permit was granted them for construction of a spur across the Pleasanton-Livermore highway. F. W. Erlin of San Francisco is vice-president and general manager of the company.

B. F. Affleck on Outlook for Cement Industry

IN AN article in the *Chicago Tribune*, signed by one of its staff writers, B. F. Affleck, president of the Universal Atlas Cement Co., Chicago, Ill., is quoted as follows:

"Because of the present poor picture in the building industry, with which the cement business is closely linked, Mr. Affleck does not look for any spectacular rise. Rather he says that if the cement industry increases its volume 5% or more each year during the next few years it will do well.

Lists Five Favorable Points

"However, Mr. Affleck finds a number of factors favorable to the industry, which are:

"1. Present prices are more nearly stabilized than they have been for a long time.

"2. Highway construction.

"3. Fast rising obsolescence in building which will demand either replacement or improvement.

"4. Increasing demand on the part of the public for fireproof construction both in private and public buildings.

"5. The present doubling up of families, which, when times become more normal, will demand construction to provide for their housing needs.

"The peak was reached in the cement industry in 1928, Mr. Affleck said, when the nation produced about 175,000,000 bbl. In 1930 and 1931 production dropped sharply and it is estimated that the output for 1932 will not be more than 80,000,000 bbl. In 1915 production stood at 85,914,907 bbl., in 1920 it was 100,023,245 bbl., and in 1925 production was 161,658,000 bbl.

Cement Follows Steel

"The use of cement follows closely that of steel, Mr. Affleck said, and consequently the present production of this basic commodity in point of manufacturing capacity parallels that of steel. Cement plants are now operating at about 19% of capacity. The steel industry has been currently running at from 19 to 21% of capacity.

"In the boom period of the late 1920's manufacturing capacity increased at a faster rate than did production, consequently the spread between production and capacity is very wide. One of the big problems of the industry will be to narrow this spread.

"In 1922 the average price of cement was $1.44 a barrel, Mr. Affleck said, while now the price averages $1.10. A serious situation which formerly existed because of cut-throat competition has been much improved, he added.

"The country's use of cement in normal times is divided as follows: Road paving, 33½%; public and commercial buildings, 25%; small towns and farms, 15%; concrete products, 8%; railroads, 6½%; sewers, drainage, etc., 5%; sidewalks and driveways, 4%; and bridges, dams, reservoirs, 4%."

Meet in Chicago

AVER successful meeting of the Portland Cement Association was held in Chicago, November 14-16. Leaders of the industry from all parts of the United States and Canada attended. The meeting was the 30th anniversary of the association and many congratulatory expressions were received from prominent people.

Sentiment in the industry was decidedly better, though a feeling was evident that present conditions would require greater effort than in the past to secure the business necessary to keep the industry in a healthy condition.

Charles F. Conn, president, Giant Portland Cement Co., was elected chairman of the board of directors. New directors elected for three year terms were: H. L. Block, president, Missouri Portland Cement Co.; Charles Boettcher, president, Oklahoma Portland Cement Co.; G. S. Brown, president, Alpha Portland Cement Co.; C. B. Condon, secretary and general manager, Hawkeye Portland Cement Co.; John J. Porter, president, North American Cement Corp.; and Joseph S. Young, president, Lehigh Portland Cement Co.

Directors elected for a one year term were: Charles Horner, president, Kosmos Portland Cement Co.; J. B. John, president, Medusa Portland Cement Co.; and M. C. Monday, president, Hermitage Portland Cement Co. and Cumberland Portland Cement Co.

Holdover members of the board of directors are: B. F. Affleck, president, Universal Atlas Cement Co.; George F. Coffin, secretary-treasurer, Nazareth Cement Co.; Charles L. Hogan, vice-president, International Cement Corp.; J. D. Johnson, president, Canada Cement Co., Ltd.; Morris Kind, president, Hercules Cement Corp.; E. P. Lucas, president, Superior Portland Cement, Inc.; Blaine S. Smith, president, Pennsylvania-Dixie Cement Corp.; L. T. Sunderland, president, Ash Grove Lime and Portland Cement Co.; John Treanor, president, Riverside Cement Co.; C. E. Ulrickson, vice-president, Trinity Portland Cement Co.; E. J. Mehren, president, Portland Cement Association; and W. M. Kinney, vice-president and secretary, Portland Cement Association.

White Cement Plant Starts Operation

OPERATION of the Chubbock, Calif., plant of the National Portland Cement Co., was started the last week in October. The plant is producing 200 bbl. of white cement daily.

More than 250 El Paso, Tex., stockholders have waited three years for the plant to be placed in commercial operation, the *El Paso Post* reports. Stock originally sold there for $5, $10 and $25 a share.

Congratulations on 30th Anniversary

THE following telegrams were among the many congratulatory expressions received by the Portland Cement Association on 30 years of service:

"Having just visited Hoover Dam, your request for message to be read at the 30th anniversary dinner of the Portland Cement Association reaches me at a moment when I have just observed a most impressive demonstration of the tremendous significance of the cement industry in modern life in making possible engineering works whose end results are human homes and human happiness. I will be obliged if you will express my cordial greetings to the members of the association and my hearty good wishes for their continued success."

HERBERT HOOVER.

"On the 30th anniversary of your organization I extend my hearty congratulations to the officers and members of the Portland Cement Association on the good work which they have done in the interest of the producers and users of cement and on the wholesome influence that has spread from the cement industry to other parts of our industrial body not directly associated with cement. I refer not alone to your educational activities looking to the wider use of your product, although such activities are essential and highly commendable, but more especially to the impartial and scientific work of the association that has for its objective the building of public confidence in the quality of a commodity so widely used. Equally important, in my opinion, is that part of your association's work that relates to the personal safety of the men employed at the quarries and cement mills from accidents incident to their work. Safety and production must go hand in hand. That such a course is entirely feasible, and that success in the prevention of accidents may readily be achieved, your Association is daily demonstrating to industry in general throughout the United States."

ROY D. CHAPIN,
Secretary of Commerce.

"On behalf of the Chamber of Commerce of the United States I wish to extend heartiest congratulations to the Portland Cement Association on the occasion of its 30th anniversary. Stop. After a generation of accomplishments in an industry important to all sections of the country your association in facing the conditions immediately ahead and the longer future will have the benefit of experience and established connections as well as new plans and experimentation."

H. I. HARRIMAN,
President,
Chamber of Commerce of the United States.

Importers Must Put Up Bonds on British Cement

THE NEW YORK CUSTOMS APPRAISER has issued a notice of suspicion of dumping of British cement into the United States, according to the *Wall Street Journal*, New York City.

The notice of suspected dumping follows allegations made here before Customs Commissioner Eble by the domestic industry.

A bond has been required in the amount of the value of each shipment of such cement to guarantee the ability of the importer to pay an anti-dumping penalty if a finding of dumping is made as a result of an investigation.

Foreign portland cement imports for a number of years has exerted a malign influence on cement prices in the seaboard markets. Early last August a general advance in price by the domestic manufacturers of from 19c. to 29c. a barrel was put into effect in the entire eastern territory, with the exception of metropolitan New York.

The latter district was excluded because of the low figure at which the foreign product was deliverable in that market. The European manufacturer, with cheap labor, depreciated currencies and extremely low ocean freight rates (the product often being carried as ballast), is able to lay down cement in American seaports at a price that precludes any profit to the domestic competitor.

Although moderate in the aggregate as compared with total American consumption, foreign imports have had a demoralizing effect on the Coast and immediate surrounding markets. Because of the obstacle of railroad freight rates, the foreign product is restricted to cartage distance of the port of landing, with the result that it displaces the domestic output on the seaboard, and the United States product is consequently backed up on the markets already well supplied.

During the first seven months of the current year imports of cement totaled 316,950 bbl., compared with 315,935 in the corresponding period of 1931, an increase of 1015 bbl. During the same period shipments of the domestic producers declined to 64,212-000 bbl. from 102,807,000 in 1931.

Great Britain, Belgium and Denmark have been important shippers to the American market. In September, of the 78,600 bbl. arriving in this market, 52,564 bbl. came from Denmark, 18,513 from Belgium.

Elects Two Vice-Presidents

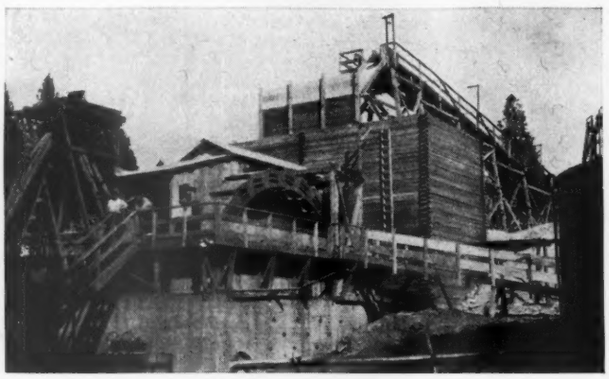
FOLLOWING the meeting of the board of directors of the Westinghouse Electric and Manufacturing Co., announcement of the election of C. E. Stephens, formerly commercial vice-president, with headquarters in New York, as vice president and of N. G. Symonds, formerly commercial vice-president at Chicago as vice-president in charge of sales was made.

New Machinery and Equipment

Grinding and Classifying Unit

AN INNOVATION in grinding equipment that should be of much interest to the rock products industry is the Hadsel mill for which the Hardinge Co., York, Penn., has acquired world rights to manufacture and sell. A brief description of the mill was given in the October 22 issue of Rock Products.

An outstanding feature of this new mill is that it will take quarry run material containing lumps as large as 2 ft. in diameter and reduce it in one operation to any fineness required. The size of the finished material may be regulated as desired. According to the manufacturer, ore of this size has been ground to 95% through 200 mesh in the Hadsel mill, with an exceptionally low power cost.



Installation crushing ore

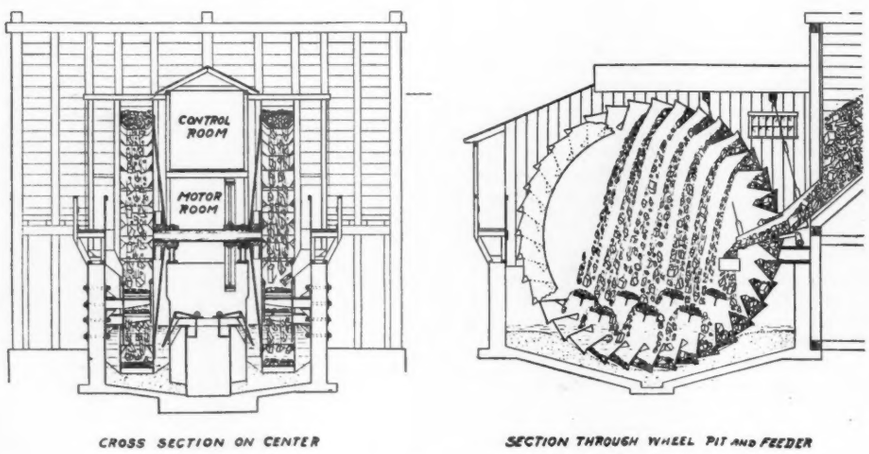
The principle of the mill is well illustrated in accompanying illustrations. Briefly, it consists of a large bucket wheel revolving in a shallow tank. Coarse material is fed into the wheel and there is a continuous flow of water into and out of the tank. Inside the bucket wheel, located near the bottom, but above the water level, are a series of smooth stationary striking plates set at a slight angle.

The buckets are designed to lift the ore to be crushed to the maximum height of the wheel before it drops to the striking plates. On the rim of the wheel opposite each bucket is located a scoop lip with a small open space between the scoop and the back of the bucket so that any material in the tank will be scooped up and deposited in the bucket.

The tank in which the lower portion of the wheel dips as it rotates is a classifier. Along one side of this classifier is located a baffle extending into the tank below the water. The baffle is adjustable by a hand wheel, so that the velocity of discharge may be varied at will. Changing the velocity of the discharge automatically changes the size of finished material overflowing the classifier weir.

Among advantages claimed for the mill are that it is simple to operate and is not easily overloaded; repairs are very low; the overall, or installed cost of a Hadsel mill unit is less than equipment now in use for this purpose; and that the operating cost per ton of material is lower.

These mills are made in capacities of from 25 tons per day with capacity for 12 in. material to units in excess of 2000 tons per 24 hr.



CROSS SECTION ON CENTER

SECTION THROUGH WHEEL PIT AND FEEDER

Installations are planned for double unit

Conveyor Gives Long Service

AN INSTALLATION of a "Pyrasteel" screw conveyor in the La Salle, Ill., plant of the Marquette Cement Manufacturing Co. is of considerable interest. The conveyor was designed and cast by the Chicago Steel Foundry Co., Chicago, Ill.

Long life at high temperature

Handling hot flue dust at about 1900 deg. F., this Pyrasteel screw replaced a fabricated screw which required replacement every one to three days. According to a recent issue of *Nickel Steel Topics* this nickel and chromium alloy steel screw has been in this continuous service since July, 1930. It has resulted in a considerable saving over the cost of the type of screw it replaced, the manufacturer states, besides saving the labor required for making the frequent replacement and the interruption in production.

•

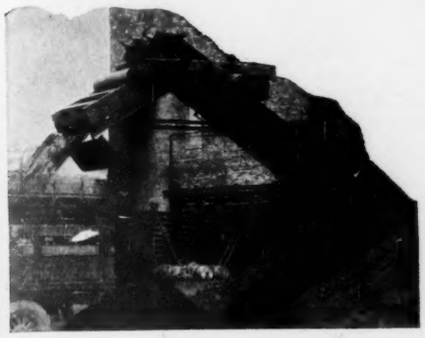
Improves Light Pump

IMPROVEMENT to its lighter pumps is announced by the American Manganese Steel Co., Chicago Heights, Ill. The most important feature announced in this improved pump is development of the Type "C" bearing. In this pump the main and thrust bearing are combined in one housing and are lubricated from the same oil well. Either ring oiling type or anti-friction bearings may be had, and pumps may be converted in the field with no major alterations.

The main bearing is adjustable so that the shaft and impeller may be moved horizontally with the casing. This makes it possible to maintain a constant clearance between the impeller and the entrance side of the pump. Rigidity has been provided to an unusual degree, it being practically impossible to pull the pump out of alignment, even when the pump is set on an uneven foundation and the bolts heavily drawn down, the manufacturer states. It is made in 6, 8 and 10 in. sizes.

Vibrator Unit for Loaders and Conveyors

A SMALL and compact single-deck vibrator, 36 in. wide and 58 in. long, of all-steel construction and weighing approximately 450 lb., for use at ends of portable



For final screening before delivery

conveyors and loaders, or in place of plain gravity screens at points of discharge from bins, has been announced by the Universal Vibrating Screen Co., Racine, Wis.

This unit is easily installed on a portable conveyor as shown in an accompanying view.

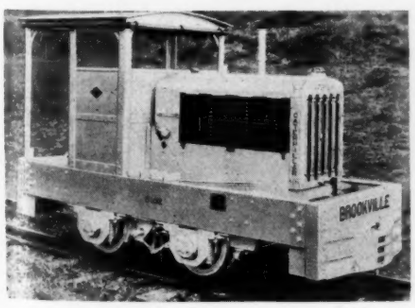
Improvements in design and construction have also been adopted on the Type "M" heavy duty, single- and double-deck screens manufactured by the Universal Vibrating Screen Co. It also reports increased sales on these models during the past season.

●

Adds New Line of Locomotives

THE Brookville Locomotive Co., Brookville, Penn., announces a complete series of industrial locomotives with "Caterpillar" engines. This series involves the use of three "Caterpillar" power plants, identical to engines used in its Model 25, Model 35 and Model 50 tractors.

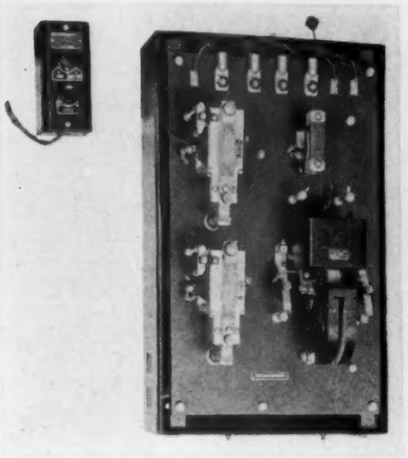
The "BCL" series are now available in 5, 6, 7, 8, 10 and 12 tons weights. They are supplied for all track gages. Four operating speeds are offered in both forward and reverse work, with range of approximately 2 to 15 mi. per hour. They are supplied standard for the use of gasoline as fuel, with kerosene or alcohol burning equipment optional. Distribution will be primarily through Caterpillar dealers.



Made for all track gages

General Purpose Starters

A NEW line of general purpose mill type starters for constant speed direct current motors has been announced by the General Electric Co., Schenectady, N. Y. These starters utilize newly developed accelerating contactors which have been designed not only to act in the capacity of a relay to provide time delay, but also to short out the starting resistor by means of a contact finger. The new accelerating contactor, therefore, replaces two conventional devices; namely, the accelerating relay and the old accelerating contactor.



Has "accelerating" contactors

The new general purpose mill type starters are available in sizes from 1 hp. up to 75 hp. Each starter mounts the following devices: One line contactor, equipped with interlock for undervoltage protection; one to three magnetic time accelerating contactors; one thermal overload relay; one starting resistor, and one sheet metal enclosing case.

●

Hydraulic Classifier

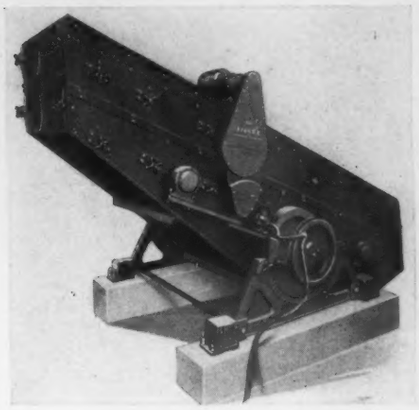
A HYDRAULIC CLASSIFIER making three or more distinct products is announced by the Hydrotator Co., Cleveland, Ohio. The device is a combination of a thickener and classifier. It consists of three zones of action: the free settling zone, and the "hindered" settling zone in which two separations are made. In "hindered" settling continual circulation of the finer solids builds up the density of the circulating medium so that the lifting effect for a given upward current is increased. The coarser material meets a uniform regulated upward current of clear water which excludes from the underflow any material which should go over the overflow, the manufacturer states.

This classifier is designed to separate clay from sand or sand from gravel in unlimited quantities. By drawing products from different levels in the tank three or more sizes may be made.

●

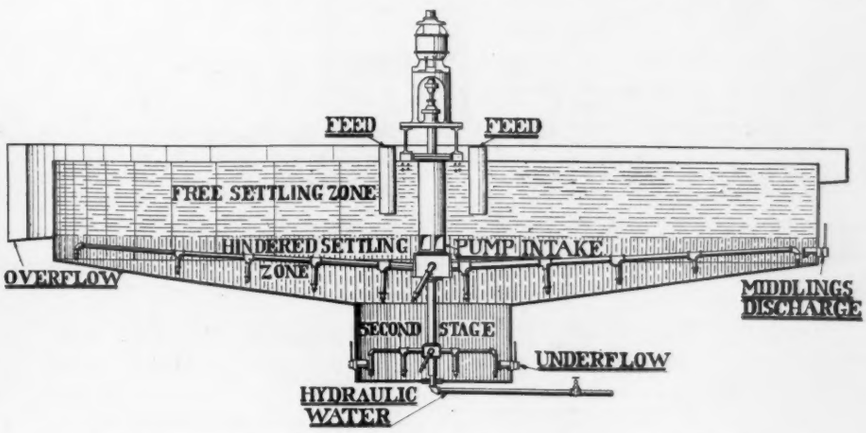
Screen Cleans Automatically

ANNOUNCEMENT of an automatic cleaning device for its "Jigger" vibrating screen is made by the Productive Equipment Corp., Chicago, Ill. The cleaner con-



Cleaner requires little space

sists of brush carriage and driving belts, gear and chain case driving mechanism and an electrical timing device. The screen cloth is brushed from below in both directions. It is adjustable so that the number of times per hour the brush is operated may be adapted to operating conditions. This device will find applications in rock products plants where blinding occurs due to plugging of the mesh owing to near sizes and peculiar shapes of particles, such as fine silica sands, finely ground limestones, etc.



Zones of action in which three or more sizes of products may be made

THE INDUSTRY

Incorporations

Sunshine Crystal Co., Mineral Wells, Tex. P. H. Whittington and R. R. Bossier. Mining.

Miller Concrete Pipe Co., Valdosta, Ga., $15,000. Leo J. Miller, Valdosta, and W. F. Scott, Thomasville, Ga.

Nagnol Sand and Gravel Co., New York City, N. Y. (Delehanty, Hannon and Evans, 20 Exchange Pl., New York City), 100 shares common.

Forrer Coal and Building Supply Co., formerly Forrer Lime, Cement and Coal Co., 2122 N. Humboldt Ave., Milwaukee, Wis. Fred Forrer, president. To deal in building materials.

Merom Sand and Gravel Co., Indianapolis, Ind., incorporated in Illinois, $5000. L. B. Koehne, John E. Hollett, Ben Stone and Merlin M. Dunbar of Indianapolis. Wm. H. Wyckoff, Illinois representative, 1024 East Moore St., Decatur, Ill.

Quarries

M. E. Gillioz, Monett, Mo., has installed a crushing plant south of Cassville, Mo.

Joe Felthauser, Nebraska City, Neb., is considering opening a stone quarry on the old townsite of Wyoming.

Standard Rock Inc., New Philadelphia, Ohio, has had J. E. Patrick named receiver with power to dissolve the corporation.

Sullivan, Mo. The state rock crusher used on the maintenance of the New Haven-Washington road was destroyed by fire recently.

Earl Miller and Ed Noble have opened a quarry at Rockview near Chaffee, Mo., and are supplying ballast stone to the Cotton Belt Railroad.

Martinsville, Va. The state's rock crusher is being moved from Washington county to Pittsylvania county, where it will soon be put in operation.

Thurman, Ia. Work was started on the rock quarry north of here, where Langfitt & Co. of Cedar Rapids are getting out rock for road surfacing.

Sellersburg Stone Co. is installing a permanent crushing plant near Madison, Ind. It is understood a contract for material for crushed stone has already been obtained.

Plattsmouth, Neb. A stone quarry has been opened here and contract for a thousand carloads of stone to be used in rip rap work along the Missouri river awarded it.

Carrollton, Mo. Work was started on stripping a rock quarry in the vicinity of Miami Station. According to report, stone taken from the quarry will be stocked until it will be needed for river improvement work.

Kelley Island Lime and Transport Co. has resumed operations at its stone quarries on Kelley Island, Ohio, after having been closed down for the past year. Boats long out of commission have been recommissioned.

Albert Mulvenna, Vinton, Ia., who installed a rock crushing plant at Red Oak recently, announces that the crushing plant will be operated there permanently. Rock from the deposit being operated is said to be of excellent quality.

Sand and Gravel

William Webb, Andover, Ohio, has purchased the gravel pit at Kinsman.

F. A. Becker Co., Milwaukee, Wis., has filed a voluntary petition in bankruptcy in federal court. Petition was signed by R. H. Whitehead, president. Liabilities were listed at $65,260 and assets at $41,881.

Gadsden Sand and Gravel Co., Gadsden, Ala., has orders in sand and gravel to keep its plant in continuous operation for eight months, it is reported. Most of the sand will be used in road construction.

Kittanning, Penn. The river tugboat *R. F. Winton*, en route to Kittanning to move the first shipment to Pittsburgh of an order for sand and gravel, was destroyed by fire and explosion recently. The origin of the fire could not be determined.

Cement

Lehigh Portland Cement Co. has reopened its Oglesby, Ill., plant, which has been closed since February.

Rapid City, S. D. The state cement plant reports third quarter business was good and that during recent months a $24,000 deficit for the first six months has been more than made up. The plant is in full operation and will continue so indefinitely, it is reported.

Ironton, Ohio. James Winters has filed suit in common pleas court appealing the action of the Industrial Commission of Ohio in denying him compensation for injuries which he sustained while employed at the Alpha Portland Cement Co. plant. He claims that he was overcome by fumes while drilling. He made application for compensation from the state insurance fund but it was denied.

Oklahoma Portland Cement Co., Ada, Okla., is operating at increased capacity, giving employment to about 400 men. Chauncey D. Nichols, vice-president and state chairman of the National Share-the-Work campaign, announces that the company has established its Ada plant on a three-shift day instead of two shifts as formerly. Mr. Nichols also reports he is advised these same plans will be followed by the Dewey Portland Cement Co. with plant at Dewey, Okla.

Cement Products

Nevada Duntile Corp., Reno, Nev., suffered loss of its plant by fire recently.

Schmidt Concrete Co., North Mankato, Minn., had its plant destroyed by fire October 28. Mr. Schmidt plans to rebuild the plant immediately.

Portland Cement Association, Chicago, Ill., has issued a book of plans for houses estimated to cost from $2700 to $6600. Plans for 18 houses are included.

John A. Miller has become affiliated with the Manegold Stone Co. and the Jaeger Sand and Gravel Co., both of Milwaukee, Wis., to promote "Quality" concrete, a ready mixed concrete.

J. L. Hoffman cement block factory, Reno, Nev., had its plant and building destroyed by fire in October. It was expected that the plant would be rebuilt and in operation early in November.

Longview Concrete Pipe Co., Longview, Wash., has installed equipment for producing sand and gravel from the Cowlitz river. The state is paid a royalty of 5c. per cu. yd. for material removed from the river.

Lime

Payton Lime Co., Bellingham, Wash., shipped its first scow of lime rock October 26.

Superior Lime and Mining Co., Wenatchee, Wash., is planning expansion and improvement to include new lime kilns and installation equipment.

Western Lime and Cement Co., Green Bay, Wis., has started production of chemical lime at its new hydrating plant and expects to reach a capacity of 100 tons daily.

Marblehead Lime Co. has added to its plant force at Springfield, Mo., as a result of slowly increasing business. The plant is still operating at less than 50% capacity, it is reported.

Keller Lime Co., Inc., Baltimore, Md., has acquired the lime manufacturing and hydrate plant formerly operated by O. J. Keller Lime Co. It is installing equipment and later plans installation of modern stone crushing plant.

Malden, Mass. It is believed that one of the few buildings in the United States built with mortar in which sugar was used is located here. Samples of mortar from the Faulkner Methodist Episcopal Church have been sent to Mellon Institute for investigation.

Silica

Industrial Silica Corp. resumed operation at its Dundee, Ohio, plant, November 2.

Other Rock Products

Rock Port Minerals, Inc., Malvern, Ark., will erect a rutile-titania di-oxide concentrates plant with a daily capacity of 6 tons here. Construction will begin about December 1.

Minnesota Mining and Manufacturing Co., St. Paul, Minn., is installing equipment at its Wausau, Wis., plant to produce color quartz, an artificially colored material used in surfacing composition roofs.

Victoria, B. C. Contract to build a fertilizer plant modeled after the plant of the Consolidated Mining and Smelting Co. at Trail, B. C., has been awarded by the Mitsubishi Shoji Kaisha of Japan to A. Edgar Knowles, head of the International Electrolytic Plant Co. of Sandycroft, Chester, England. This plant will cost about $10,000,000.

Personals

J. C. Shumberger, controller of the Lehigh Portland Cement Co., Allentown, Penn., was recently elected a director of the Controller's Institute of America at its first annual convention.

H. L. Cooper, of the United States Gypsum Co., recently discussed advertising aids which have been used by the United States Gypsum Co. before the Ad Club of Des Moines, Ia.

George M. Sharer

George M. Sharer has been appointed sales manager of its eastern territory with headquarters in Philadelphia by the Link-Belt Co., Chicago, Ill. He will direct sales of all the company's offices in the Atlantic coast states. Mr. Sharer has been with the Link-Belt Co. for the past 32 years.

Dr. Irving Langmuir, associate director of the General Electric Research Laboratory, will be presented with the Nobel Award in Chemistry for 1932 in Stockholm, Sweden, on December 10. Dr. Langmuir is the second American chemist to have been honored by the Swedish Academy of Science in 31 years.

Geo. Oenslager, of the B. F. Goodrich Co., Akron, Ohio, has been awarded the Perkin medal for 1933. It is given annually for the most valuable work in applied chemistry and is regarded as one of the highest honors which can be bestowed on an American chemist. The award was given Mr. Oenslager on his pioneering work for the rubber industry on organic accelerators as well as other chemical research contributions.

Obituaries

Eynier C. Peterson, salesman for the Lehigh Portland Cement Co. at Rockford, Ill., and his two daughters were drowned recently in Lake of the Woods when their canoe overturned. Mrs. Peterson, who was with them, was saved.

George Lincoln, assistant advertising manager of the United States Gypsum Co., died October 29 at the St. Elizabeth Hospital in Chicago, Ill., following a week's illness. Mr. Lincoln had been associated with the United States Gypsum Co. for 27 years.

Julius Sorensen, a concrete products manufacturer of Racine, Wis., died recently. Mr. Sorensen was an active supporter of the various associations of the concrete products industry and contributed freely to constructive development of the concrete products industry.

Manufacturers

Southwest Road Show and School announces its annual meeting in Wichita, Kan., will be held in February.

Four Wheel Drive Auto Co., Clintonville, Wis., announces it has adopted the five-day week to aid in the National Rehabilitation Program.

Farrel-Birmingham Co., Inc., Ansonia, Conn., announces appointment of E. J. von der Heide as representative in the middle west territory with headquarters at Dayton, Ohio.

Falk Corp., Milwaukee, Wis., announces appointment of C. J. Sturmfelsz as representative in the Baltimore, Md., district and of H. Douglas Steir in the Atlanta, Ga., territory.

Worthington Pump and Machinery Corp., Harrison, N. J., announces appointment of Hugh Benet as manager of its Harrison works. Mr. Benet was previously manager of the Holyoke, Mass., Works.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Laboratory Equipment. Folder describes the "F L S" separator for determining particle size of fine materials. F. L. SMIDTH AND CO., New York, N. Y.

Vibrating Screens. Bulletin 732 describes the "Jigger" vibrating screens, illustrating construction features. PRODUCTIVE EQUIPMENT CORP., Chicago, Ill.

Crushers. Bulletin 111 describes the Traylor type BH gyratory crusher. Applications and details of construction are given. TRAYLOR ENGINEERING AND MANUFACTURING CO., Allentown, Penn.

Excavators. Bulletin 3210 describes "General" excavating equipment. Special features are described and operating information is given, as well as specifications for various units. GENERAL EXCAVATOR CO., Marion, Ohio.

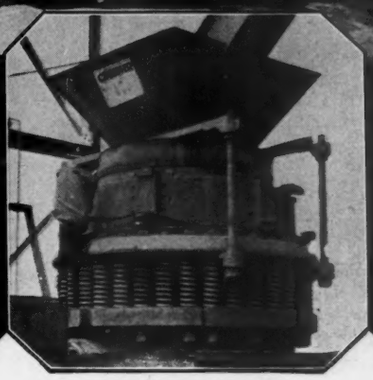
Rock Drills and Sharpeners. Catalog 4101 gives consolidated information concerning Ingersoll-Rand equipment for drilling rock and reconditioning drill steels. Data on correctly heat-treating steels is included. INGERSOLL-RAND CO., New York, N. Y.

America's Finest Gravel Plant
And It, Too, Has,
SYMONS CONE CRUSHERS

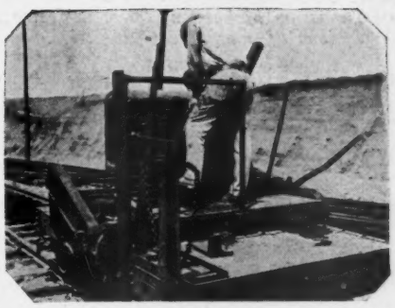
WHAT is believed to be America's outstanding gravel plant is that of the Kaiser Paving Company at Radum, California. It is the last word in gravel plant design, built to furnish a product that meets the most rigid specifications and at the lowest possible cost.

As in most leading crushing plants, here too is installed a Symons Cone Crusher. This is one of the factors for the successful showing this plant has made. It is one more evidence that leaders standardize on Symons Cones for reduction crushing.

Here also another Nordberg product is in service, a Nordberg Track Shifter. This machine takes the place of hand labor when shifting track laterally, or raising it vertically.



The four foot Crusher in the Radum Plant.



This machine and one man takes the place of a large labor gang when shifting track.

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

NEW YORK CITY, 60 E. 42nd St. LOS ANGELES, CAL., Subway Terminal Bldg.

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Mine Hoists — Underground Shovels — Compressors
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Recognized the World Over as the Leader in Its Field

Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

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TRADEPRESS PUBLISHING CORPORATION

542 South Dearborn Street, Chicago, Illinois, U. S. A.

Nathan C. Rockwood, President; Fred S. Peters, Vice-President
T. I. McKnight, Secretary I. H. Callender, Treasurer

NATHAN C. ROCKWOOD, *Editor and Manager*
EDMUND SHAW, Los Angeles, Calif., *Contributing Editor*
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GEORGE M. EARNSHAW, *Eastern Advertising Manager*
E. H. PAULL, *Eastern Representative*
250 Fifth Ave., New York City. Tel. Ashland 4-4723

A. W. B. LAFFEY, *Central Representative*
L. C. THAON, *Western Representative*
Chicago. Tel. Wabash 3714-3715

SUBSCRIPTION—Two dollars a year to United States and Possessions. $4.25 a year to Canada (including duty) and $4.00 to foreign countries. Twenty-five cents for single copies

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